SIXTY-SEVENTH YEAR

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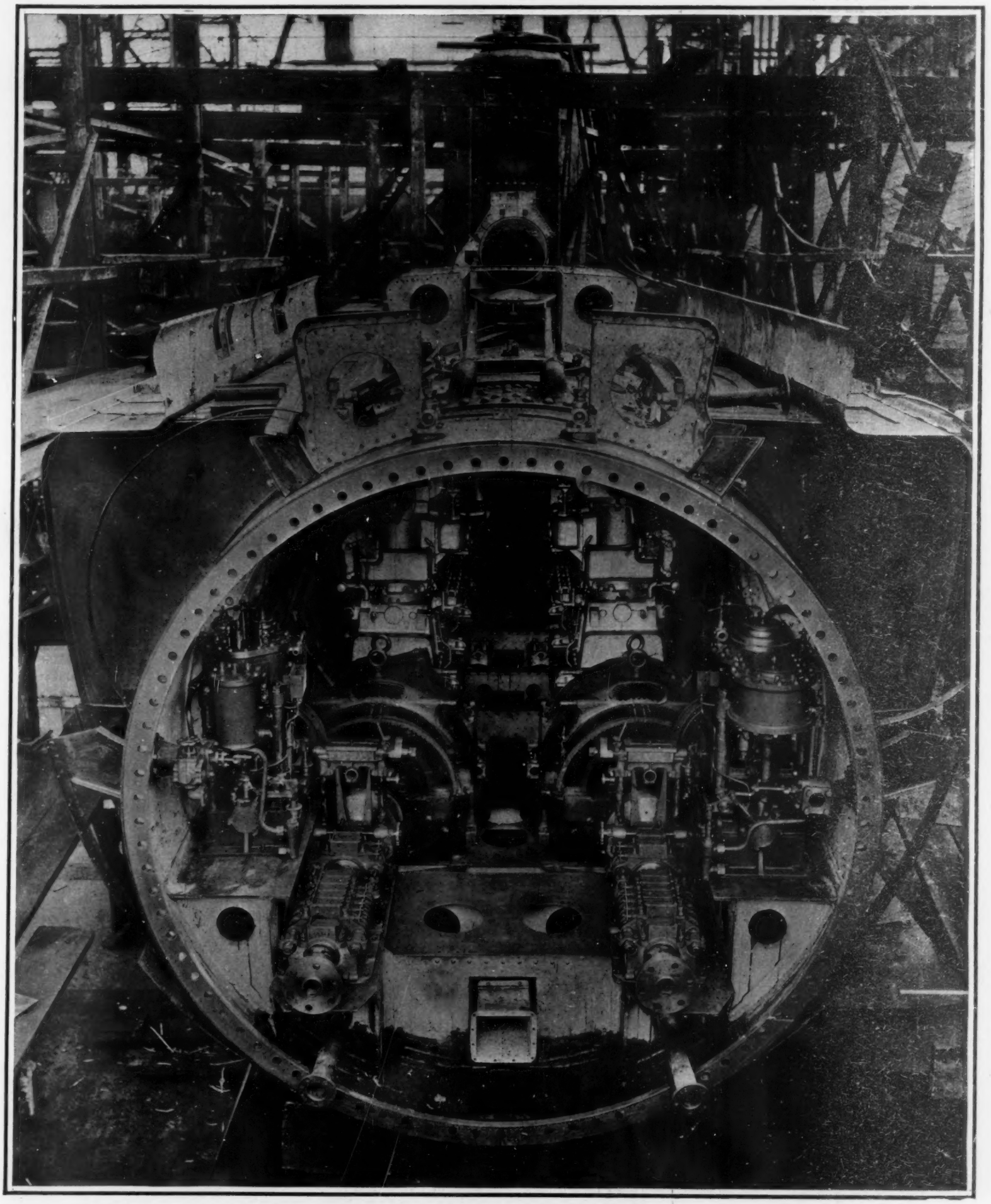

View of the interior before the rear section was bolted on. Note the thrust bearings, the electric motors, and the gasoline engines.

THE SUBMERSIBLE "KOBBEN" FOR THE NORWEGIAN NAVY.—[See page 299.]

SCIENTIFIC AMERICAN

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately and in simple terms, the world's progress in scientific knowledge and industrial achievement. It seeks to present this information in a form so readable and readily understood, as to set forth and emphasize the inherent charm and fascination of science.

The Gould-Scientific American $15,000 Prize

THAT the munificent offer by Mr. Edwin Gould of a prize of $15,000 for the best aeroplane equipped with multiple engines and propellers, has awakened widespread interest is proved by the number of designs which have been submitted to this office. We take this opportunity of stating publicly that inasmuch as a representative of the SCIENTIFIC AMERICAN will be one of the judges of the contest, it is impossible for us to offer any opinion upon the merits of such designs. Furthermore, it should be clearly understood that mere paper plans, however much excellence they may possess, will not be considered in the present contest; which must be between practical flying machines, carrying an operator and flying over a prescribed course under strictly regulated conditions. Plans are required merely to assist the judges in arriving at a decision.

In spite of the great advance which has been made in the speed and duration of flight since the date when Mr. Gould's offer was first made public through our columns, the necessity for an improvement in the motive power of the aeroplane, particularly as regards its durability, is as great to-day as it was last year; in fact, the energy of aeroplane builders is being directed to an improvement of the motive power more than to any other part of the machine. The offer of the Gould prize, therefore, is timely, and its object of promoting safety and durability is distinctly in line with the present trend of aeroplane development. Multiple engines and twin propellers have been among the most important factors in rendering travel by ocean steamship safer than travel on land. Properly designed and adjusted, they should prove equally efficient in promoting continuity of flight, and in bringing the aeroplane to a safe and perfectly controlled landing.

A Satisfactory Compromise

SECRETARY OF WAR DICKINSON is to be congratulated on the position which he has taken on the subject of lengthening the piers at this city to accommodate large ocean steamships. In permitting a temporary increase of length, he meets the pressing necessities of the White Star Company, whose 882½-foot "Olympic" will reach this port during the coming summer, and at the same time, by granting the extension for a limited period only, he sustains the army engineers in their jealous guardianship of public rights in our national waterways. The White Star Company are permitted to extend their piers for a distance of one hundred feet into the North River by building a structure of temporary open timber work, which is to be removed after the expiration of eighteen months. This will permit the "Olympic" to dock on the North River, and at the same time it will give this and other steamship companies that are building ships over 800 feet in length, sufficient time to provide suitable accommodations for berthing the new vessels.

The moral of the recent dilemma is that the whole subject of dock accommodation and the provision of suitable terminal buildings and railways, should be taken up at once and a comprehensive plan laid down, which will take account, not merely of the pressing needs of to-day, but also of the increase in size of the individual ships of the future, and particularly of those engaged in the passenger-carrying trade. The investigation of this question should cover every foot of water front that can possibly be utilized for wharf and terminal purposes. The whole scheme should be laid out on a carefully coordinated plan, so drawn up that the various sections may be constructed from time to time, to meet the growing traffic of the future. The study made by Dock Commissioner Calvin Tomkins, of that part of the problem, which covers the North River water front on Manhattan Island, is admirable, and may well serve as a basis upon which to draw up the larger plan, covering the whole of the foreshore of Greater New York.

The Spirit of Science

IN these days the practical and material gains which are brought to the community and to the individual by the advances of science are so obviously and so constantly presented to our minds, that to the casual observer the promise of such material rewards might perhaps appear to be the leading motive for man's endeavor to fathom the mysteries of nature.

Yet, if we study the history of science, this is hardly the impression which we receive. Not only have most of the great pioneers followed their light in a large measure regardless of any consideration of personal gains of a material kind, but quite on the contrary, we need only turn to the records of medieval history, to find the martyr of science, driven by the spirit within him to seek the truth at all costs, and to proclaim it though his reward be torture and death at the hands of the inquisitor.

No; the prime, the fundamental motive which has impelled men to decipher the hidden meanings of nature has not been the prospect of material gain, else had they not been willing to suffer and die for the truth, but the sublime pleasure, the exalted ecstasy that comes with revelation of truth to the master-mind.

The glorious transport of the hero—"das Heldenglück" as Ostwald calls it—few perhaps are privileged to experience. Yet the impulse to fathom the problems of our existence is so primitive, so fundamental a trait of the human mind, that probably none of us are quite free from it. In some of its phases the instinct of inquiry is most plainly evidenced in childhood, and is, alas! too often choked almost out of existence by the cares and petty annoyances of every-day life as we grow up. Enough, however, is left to most of us adults of the "child wonder" to enable us to complete by introspection our analysis of the elemental emotions through which the pursuit of science holds men in fascination.

First, then, and most primitive is our innate capacity for being stirred to wonder and awe by the contemplation of the grandeur of nature. Who has not experienced a feeling of mental exaltation when gazing up into the unfathomable depths of the "starry cluster" on some gloriously illumined summer night? At such moments there is an attempt on the part of the imagination to fill in the gaps where the discernment of our senses fails, and to span the untold distances over which our limited powers are incompetent to carry us. This exercise of the imagination is for some reason felt as a pleasurable experience.

But the feeling of wonder is only a first and very rude step in the journey which the individual and society have traveled to reach the vantage ground of modern scientific attainment. If there is a certain pleasure associated with a mere feeling of unsatisfied wonder, a new zest is added to the situation if through one circumstance or another a corner of the veil is lifted, and a gleam of understanding lights up our mental sight to a comprehension of the phenomenon that at first merely awed us. In one form this is pre-eminently the pleasure of the younger student of science, whose personal knowledge can as yet be readily extended by the comparatively easy means of imparting to him the knowledge gained by others.

As the student matures, he may pass more or less imperceptibly into the next stage of development, and taste of the pleasure which comes of the discovery of new truths by his own effort. The time when he passes into this phase can not be precisely defined. It will vary a great deal with the individual. Some, even with training specially directed toward the development of faculty and skill in this direction, will hardly do more than at the best add more or less material to our "tables of natural constants." In others the spirit of research is deeply ingrained. They will make truly important contributions to the treasure house of science. Their earliest efforts may perhaps merely lead them to rediscover independently what others had found before them. But as they grow in years and knowledge, they sooner or later give to us those gems in the crown of science, whose luster casts its rays through space and time, lending international renown and immortal fame to the pioneer genius. Such a man tastes not only of the joy of having himself gained knowledge by his own efforts, but he knows also the deeper satisfaction which springs from the consciousness of services rendered and benefits bestowed upon the world at large.

There is still another phase in scientific progress, whether we think of the individual or of the community, which brings its own pleasure: The sense of mastery over nature that follows upon successful application of scientific knowledge to the furtherance of human welfare. A James Watt teaches us to wield a new weapon in our aggressive warfare for the conquest of the world by man. A Pasteur gives into our hand the means of defense to ward off the last remaining enemies of mankind—foes which have baffled us so long, not through their strength or overpowering dimensions, but through their very elusive minuteness. Who shall say which is our greater debt, the one we owe to James Watt, or that due to Pasteur, and which the greater joy—that of the engineer adding to our means of gaining wealth, or of the devoted physician and pioneer of medical science, ministering to the health of nations?

Many are the fascinations of science, even to him who is content to look on while others toil and worship at her shrine. Greater, and indeed overwhelming, must be her hold on him who, with the hand of the expert, and the mind of the genius, explores new regions, and brings back from his excursions to his fellowmen at home the trophies of new truths wrested from nature's cypher record.

New Feats in Aviation

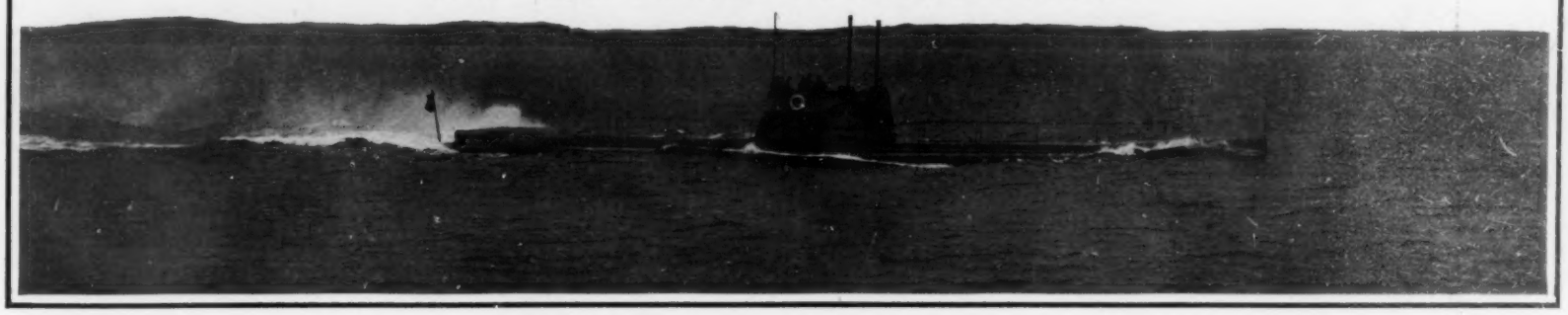
THE progress being made in aviation this year appears to be as rapid as during 1910. Curtiss has perfected his aeroplane so that he can start and alight on land or water at will, thus leaving nothing further to be accomplished in the fundamentals of dynamic flight. Wireless messages have been transmitted from an aeroplane in flight and received by land stations 40 miles away, while early this month McCurdy's biplane, at a height of 1,500 feet above Palm Beach, Florida, was able to catch messages from Key West, and even from a steamship leaving Panama, that is, over distances as great as 1,000 miles, and this despite the fact that the wireless operator was provided merely with a makeshift headpiece of towels to bind the receivers to his ears and protect him from the noise of the unmuffled motor. Thus, if ever a transatlantic aeroplane becomes a reality, its aviator may be in touch with both New York and Paris during his trip across. As for long-distance communication by wireless, messages are now being regularly sent from Glace Bay, Nova Scotia, to the Eiffel tower at Paris, and the Hertzian waves have been transmitted and received successfully in the opposite direction.

As for performances at flying, several spectacular and astonishing flights have been made during the month. The first of these was on March 3rd, when Lieut. B. D. Foulois and Philip Parmalee flew from Laredo, Texas, to Eagle Pass—a distance of 116 miles—without a stop, at the rate of 54.85 miles an hour. They carried rations for several days and made the flight for scouting purposes like those of actual warfare. During the entire trip they were in wireless communication with various land stations. Two days later Lieutenant Bague, of the Fourth Algerian Rifles, in an attempt to fly across the Mediterranean via Corsica and Sardinia, lost his way but finally alighted safely on Gorgona, a small wooded isle between Corsica and Leghorn. He covered 138 miles straight-line distance above the sea while flying for several hours, in his Blériot monoplane. The actual distance traversed was much greater, for the aviator lost his way and only managed to make Gorgona just before his fuel became exhausted.

The third recent great flight occurred on the 7th instant, in competition for the special Michelin prize of $20,000 for a flight with a passenger from Paris to the Puy de Dome Mountain—an air-line distance of 222 miles—within an elapsed time of six hours. M. Eugene Renaux, with M. Senoncque as a passenger on board his Farman biplane, circled the Arc de Triomphe soon after 9 A. M., and headed for Clermont-Ferrand. Five hours later he circled the spires of the cathedral at the latter village and alighted on the top of the Puy de Dome, 4,800 feet above the sea. He accomplished the flight in 5 hours and 8 minutes elapsed time, of which but 4 hours and 51 minutes was actual flying time, making an average speed of 44¾ miles an hour.

The Submersible "Kobben" for the Norwegian Navy

By the English Correspondent of the Scientific American



The "Kobben" running at 12 knots on the surface.

THE Norwegian navy has recently been strengthened by the acquisition of a new submersible "Kobben." This vessel is of the "Germania" type, evolved and developed by Fried. Krupp A. G., the eminent German armament manufacturer and naval builder, which has now become the standard class of submarine in the Imperial German navy. In fact, the "Kobben" may be considered the latest development in the Krupp submersible, and is not only powerful, but possesses many interesting features. The recent trials of the craft have aroused keen interest among European naval circles, owing to her striking seagoing qualities and general technical perfection. The Krupp firm have always considered the "diving" boat to be the most efficient form of submarine, and it may be mentioned that their contentions as to its all round superiority are upheld by the German government naval authorities, for there were twelve submersibles fitted for service on the high seas in the Imperial navy at the end of 1910, which on account of their speed and endurance are suited to all the conditions of modern war.

The "Kobben" was built at the Germania yards of Kiel, and measures 129 feet in length, with a beam of 12 feet 2½ inches, and a draught of 12 feet 5 inches. The displacement on the surface is 225½ tons, and when submerged 280½ tons. The vessel is provided with two hulls. The outer has the lines of a torpedo boat, which with the high freeboard and superstructure serve to render the boat extremely seaworthy. The inner hull is divided into three longitudinal sections, being built up of three circular welded sections bolted together. This shell is of sufficient strength to enable the craft to withstand safely a water pressure equivalent to a sea depth of 295¼ feet. The space between the outer and inner hulls is subdivided into a number of watertight compartments, which contribute greatly to the safety of the vessel, since a number of these may be punctured without endangering floatability. The water ballast, oil, and gasoline tanks are also carried in this space.

The engine room, containing the propelling and auxiliary machinery, is placed aft, together with a portion of the accumulator battery. Surface propulsion is effected by two sets of four-cylinder, vertical, gasoline motors, developing an aggregate of 440 horsepower, while when traveling submerged two electric motors developing an aggregate of 250 horse-power are brought into service. The capacity of the secondary battery is 590 kilowatt hours. Forward of the engine room are the internal water ballast tanks, and amidships the conning towers in which are placed all the devices for steering, diving, and controlling the boat. The conning tower, built up of light plating, has a ship-shaped form, for the purpose of minimizing resistance when the craft is traveling submerged. In the bow are the second section of the electrical accumulators and the torpedo tube room and gear. There are two torpedo tubes carried in the bow, while on the deck, aft, mounted on a bridge, is a third tube.

The diving rudders are mounted in pairs, one on either side, fore and aft, with an ordinary vertical rudder at the stern for lateral steering. Each motor set drives a reversible propeller. The accommodation for the navigating officers is in the conning tower, while the quarters of the crew of ten men are in the bow, as is also the galley.

In the Lake types of the Germania class of submersibles, Diesel engines, using heavy oil in preference to the more volatile and inflammable gasoline, are used. These motors develop from 200 to 220 horse-power. For underwater navigation the usual electric motors are utilized. The heavier oil engines are useful in those seas where the lighter fuel is unobtainable. The "Kobben," however, is adapted to gasoline, which is more easily secured in Norway. The surface speed of the boat is twelve knots per hour, and she can make nine knots per hour submerged. The radius of action on the surface at the reduced speed of nine knots is 1,450 miles, while submerged it is 45 miles at the speed of 6.5 knots per hour.

Special arrangements have been made to secure an adequate ventilation of the interior of the boat. During surface operations the air is drawn in from outside. When traveling submerged, the heated atmosphere of the engine, and the exhaled air of the crew, is drawn off through ventilators which pass it through various filtering, oxygenating and cooling devices, after which it is returned to the interior. By this means it is possible for the craft to remain under water for twenty-four hours at a time without the crew experiencing any inconvenience or difficulty in breathing. The electric accumulator compartments are hermetically sealed so as to prevent escape of poisonous gases into the interior, and to prevent the spilling of the contents through the rolling and pitching of the boat when diving. Two periscopes are carried, the tubes of which are each 16½ feet in length, which permits the craft to be navigated at a depth where it is secure from the fire of projectiles.

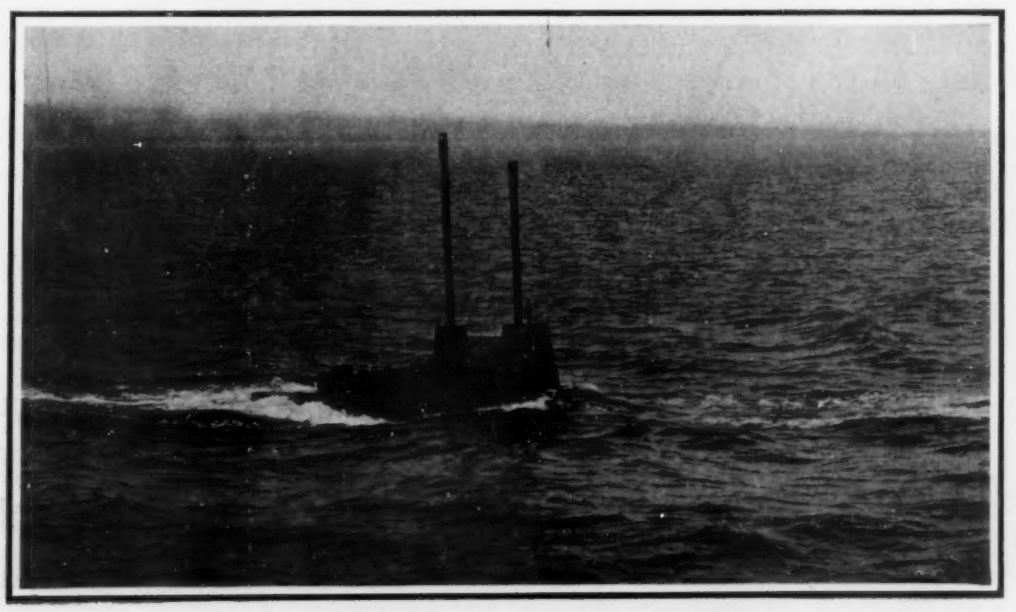
Various safety appliances are fitted to prevent the vessel being placed *hors de combat* either by hostile fire or accident. The water ballast tanks can be emptied of water and charged with compressed air very rapidly, there being a reservoir of 123½ cubic feet capacity constantly maintained under high pressure for this purpose. In order to facilitate the salving of the vessel, the outer hull is furnished with a number of shackles, to which the hawsers of the salvaging appliances can be attached for raising the craft to the surface.

A telephone wire is also carried whereby communication with the interior of the submarine from the surface can be maintained. The outer end of this line is attached to a buoy which can be released automatically.

After the "Kobben" had completed the builder's trials it was dispatched to Horten, the Norwegian naval base, under its own power. In the course of this journey it was decided to carry out a deep water test in the Baltic, and the vessel was sunk to a depth of 164 feet, where it remained for two hours. Subsequent examination showed that the water pressure had produced no permanent deformation of the hull.

Among the many tests to which the "Kobben" has since been subjected were a series of trials in the open sea, during a strong southerly gale. Several surface runs were made to prove the seagoing qualities of the boat. Afterward a number of trips were made at varying depths up to 46 feet to ascertain the effect of wave action upon the steering qualities of the boat. These tests, it has been stated, were eminently successful.

The submersible boat "Kobben" running on the surface.



The boat awash, with conning tower partially submerged.

A NEW SUBMERSIBLE FOR THE NORWEGIAN NAVY

Life-Savers for Aviators

Two New Parachutes Invented in France

WHATEVER perfection may be reserved for the future, at the present stage in the development of the new art of flying the aviator takes his life in his hands every time he rises aloft in his aeroplane. Efforts to secure greater safety may take two different directions. We may strive to prevent a catastrophe or, despairing of entirely eliminating all accidents, we may look for means which shall afford protection to the aviator in an emergency. It would seem most logical, and indeed in keeping with accepted practice in other pursuits involving life risks, to pay attention to both these aspects of the problem. Among life-saving appliances recently brought out for aviators' use there are two which seem to deserve special notice, namely, the Esnault-Pelterie safety belt and parachute, and the apparatus recently put to the test by Hervieu at the Eiffel Tower in Paris. The Esnault-Pelterie safety belt not only protects the aviator from shock, but also prevents him from being thrown out of the machine. In addition, this belt may be connected by elastic bands to a parachute, so that in case of accident the aviator, by pulling a rip cord, can open the parachute and float suspended from it by means of the belt, which is not tight enough to interfere with his movements. The apparatus is illustrated in the accompanying diagrams, of which Fig. 1 shows the belt attached directly to the frame of the aeroplane without a parachute. Fig. 2 shows the combination of the parachute with the belt. Fig. 3 gives a view of the entire apparatus at the moment after the rip cord has been pulled, and Fig. 4 shows the aviator suspended from the parachute.

The belt is composed of two curved portions *A B* which can be connected by a pin at *C* and are attached to the straps *a b* passing through the buckles *D E*. India rubber bands *F G* connect these buckles to eyes *H I* on the frame of the aeroplane. In order to put on the belt it is only necessary to draw out the pin *C*, separate the parts *A* and *B*, pass them around the waist and connect them again by inserting the pin.

When the belt is designed to be combined with the parachute it forms a closed girdle about the aviator's body, as shown in Fig. 2, and is connected by India rubber bands *F G* to two buckles *J* attached by the cords *K* to the parachute *L*. The apex of the parachute is held by a spring clamp *M*, and its folds are encircled by a glued band of cloth *N*. The edge of the parachute carries a steel wire *c*, which folds in such a manner that the mouth remains slightly open. The top of the band *N* is attached to a cord *O* connected with the link *P*, the other end of which is attached to an India rubber band or a spring *Q*, which is fastened to the chassis at *R*. The cords *S* of the parachute are attached at *T* to the cords *K*. The

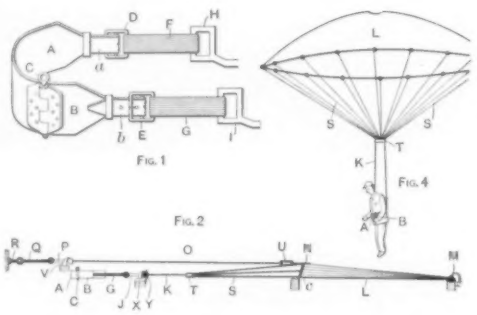


Fig. 1 Fig. 2 Fig. 4

Figs. 1, 2 and 4.—The Esnault-Pelterie safety belt and parachute.

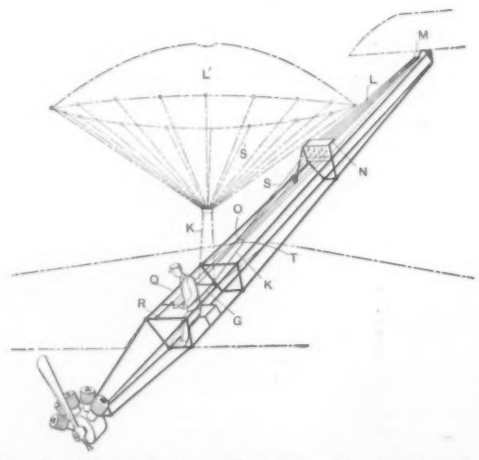


Fig. 3.—An aeroplane provided with an Esnault-Pelterie parachute.

cord *O* passes over one or more pulleys *U*. The apparatus is operated as follows: When the aviator fears a fall he pulls the cord *O* and thus, by means of the rubber band *Q*, detaches the buckle *P* from its hook *V*. Then he lets go the cord, and the rubber band *Q*, in virtue of its elasticity, exerts traction on the cord *O*, which cuts or tears off the band *N*. The mouth of the parachute is thus opened and the air enters, expands the parachute and detaches it from the hook *M*. The parachute then assumes the position *L* (Fig. 3) and the cords *K* are subjected to an upward and backward traction whereby the buckle *J* is detached from the hook *X* on which it has been held by a lightly glued strip of cloth *Y* which is torn by the pull on the cord *K*. The aviator thus finds himself lifted from his seat and suspended by the belt from the parachute, as is shown in Fig. 4.

The second device of which we have spoken is a parachute of somewhat peculiar construction designed by M. Hervieu.

One of our illustrations shows very clearly the mushroom-shaped distended envelope of the parachute as it appeared at the test recently made in Paris. In the background is seen the pillar of the Eiffel Tower, from the first story of which the device was launched. Still another view shows the parachute at a later stage in its descent to the ground. The passenger on this trial trip—who, be it said, came out of the ordeal unscathed—was the dummy shown seated on the fuselage in Fig. 7 of our illustration. The inventor, M. Hervieu, is seen standing in the foreground of this picture. The arrangement of the parachute on the fuselage of the aeroplane, when folded up and not in operation, is indicated in Fig. 8. It will be seen that the apparatus collapses into a flat parcel contained in a kind of box or case, neatly stowed away over the rear end of the fuselage.

A later test of a 26¼-foot parachute with a full-sized Blériot monoplane body and a dummy weighing 165 pounds, was very successful. After less than a second's drop, the parachute opened, and, while the body of the monoplane fell to the ground and was broken, the dummy landed without shock and at a speed of not over 7 miles an hour. A third experiment was made with a 23-foot parachute, intended for use in a dirigible, and provided with a trapeze fitted with ball bearings and weighted with 132 pounds. It is M. Hervieu's intention to develop an automatic parachute for dirigibles as well as for aeroplanes, the idea being that as soon as the dirigible becomes deflated, several parachutes will open and save the car and passengers. The weight of the parachutes used in the above experiments was only about 15 pounds.

The parachute has been the subject of much con-

(Continued on page 315.)

Fig. 5.—The trial trip of the Hervieu parachute at the Eiffel Tower.

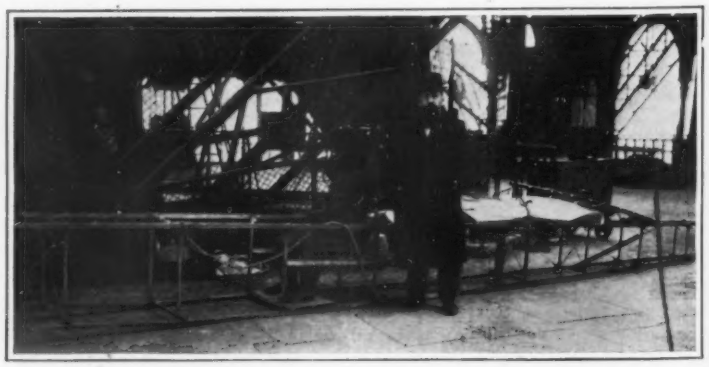


Fig. 7.—The inventor and the dummy passenger.

Fig. 6.—The Hervieu parachute descending from the first story of the Eiffel Tower.

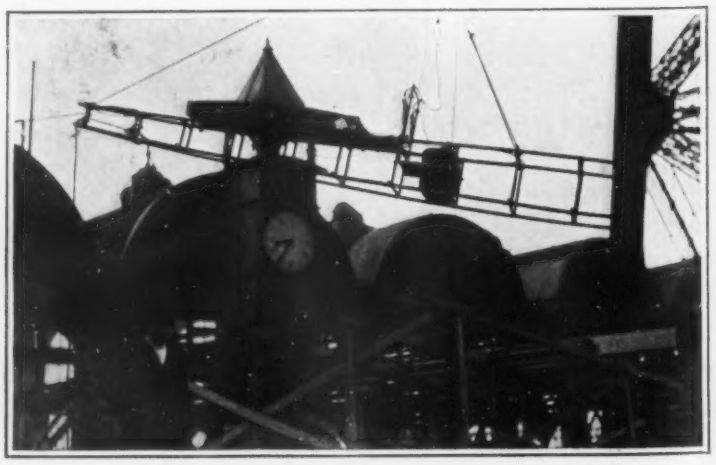


Fig. 8.—Parachute mounted on the fuselage of an aeroplane.

NEW SAFETY BELTS AND PARACHUTES FOR AVIATORS

The Automobile as an Advertiser

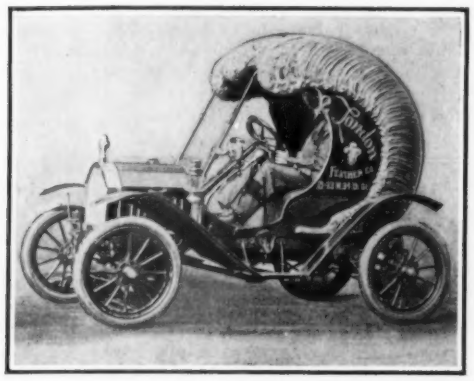
A New Way of Attracting Attention

By Arthur Buxton

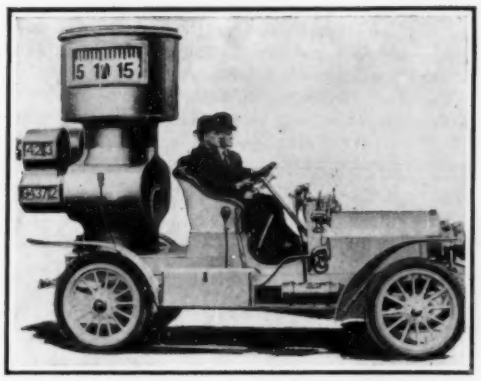
AUTOMOBILES for use in advertising are being employed by certain business establishments to serve a double purpose: To advertise the product of the company, and to make deliveries to their customers.

The vacuum bottle on wheels, shown in one of the accompanying illustrations, carries out very effectively the lines of a torpedo-type car, with its long wheelbase (151 inches), narrow neck in front, porthole side openings, and general suggestion of a "long, low, rakish-looking craft." The big bottle-body is of cast aluminium, finished inside in mahogany and red morocco leather, and the car has a six-cylinder, 120-horse-power engine, and cost, complete, about $15,000. The whole effect is that of an exact reproduction of the well-known heat-insulating beverage bottle of the travelers' convenience, perambulating the streets, and the slogan of the company, "Keeps hot; Keeps cold," is inscribed on the wheels. This car is at the present time on tour throughout the United States.

Another bottle car, often seen in the downtown business district of New York city, serves to advertise a brand of writing ink. The car is a small runabout, and is used by the New York salesmen of the ink



The curve of a huge plume lends grace and piquancy to the back and canopy of a feather company's car.

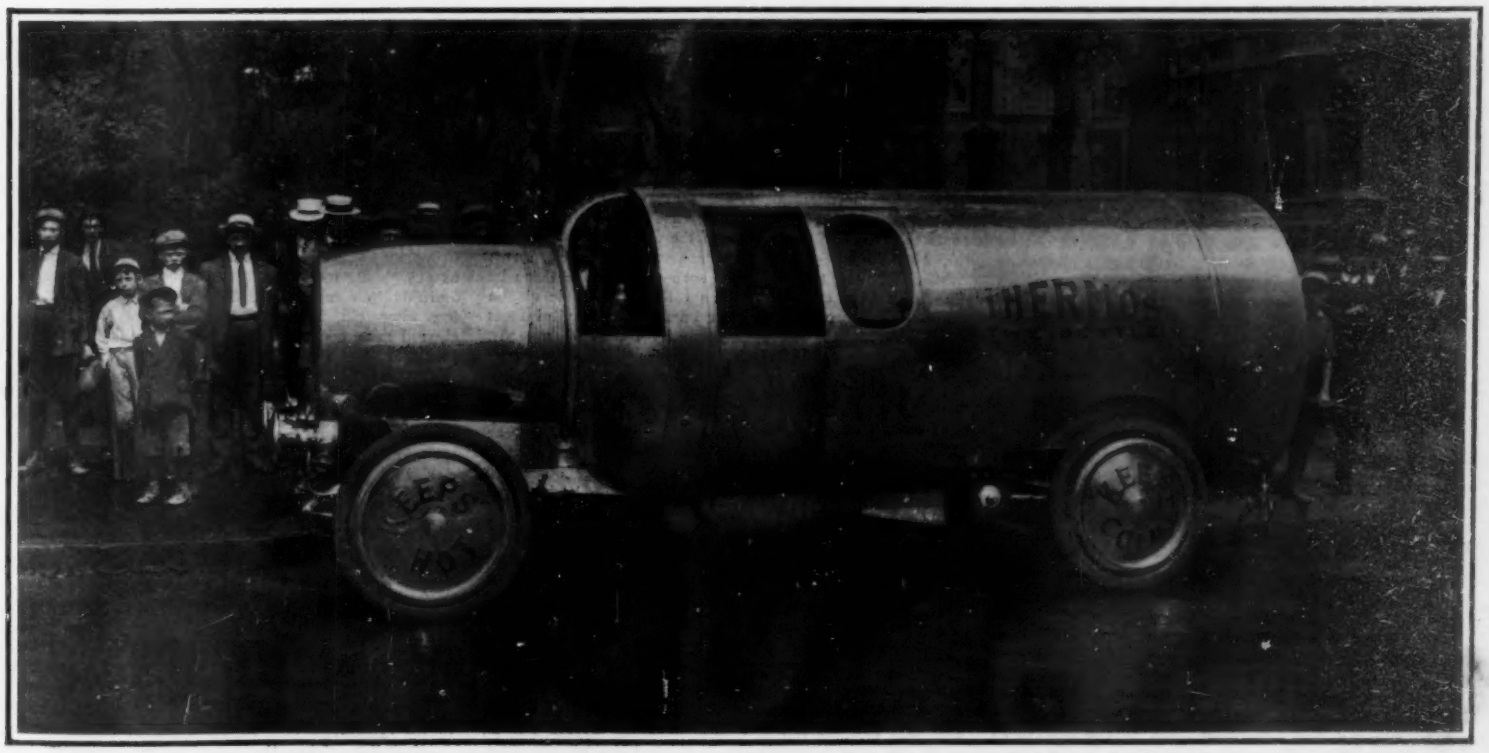


This car follows fast vehicles to demonstrate that the autos' speed is largely based on prejudice.

A bottle car used in advertising a brand of ink. The big bottle serves as a storage receptacle.

A car that carries its company's goods in rear compartment.

A geyser of puffed rice is made to burst into the glass dome of this advertising car.



The body of the machine is of aluminium and is the enlarged counterfeit presentment of a well-known heating bottle.

THE AUTOMOBILE AS AN ADVERTISER

company in visiting its trade; and the ink-bottle, carried at the rear properly right-side up, makes a capacious van for the use of the car as a delivery wagon. "Bottled goods" of another kind are advertised by the Moxie car, with its box compartment at the rear. A horse-drawn wagon is also used by this firm, having a body in the form of a big bottle of this beverage, carried in the vertical position. The driver halts at the curb-side, climbs into the bottle through a door at the back, and dispenses the beverage by the glass to thirsty passers-by.

Another example of successful representation of the article advertised in the lines of an automobile is the neat little car employed by a New York dealer in ostrich feathers. The smooth curve of a giant ostrich plume, worked into the body of the car, arches gracefully over the back and forms a canopy over the seat.

The remaining two views show the advertising autos of an "auto-meter" or speedometer manufacturer and of the company manufacturing a well-known ready-cooked breakfast food. The effect of a demonstration of the product is added to the effect of an animated trade-mark. In the first car, the gigantic instrument at the back is a working autometer, registering and indicating in exact agreement with a standard-size instrument on the dashboard of the car, and connected to its running gear. This auto has been run thousands of miles through city and suburban streets and over country roads in all parts of the country, to demonstrate that the speeds at which autos are ordinarily run are in reality safe, notwithstanding popular prejudice. The driver of the auto-meter vehicle follows a trolley car, or a team of fast horses drawing a carriage, and runs behind this other vehicle at the same speed with it, allowing its occupants and the passers-by on the road and sidewalk to observe—generally with surprise—that the customary pace of these vehicles is fifteen or twenty miles per hour, as shown in plain figures on the big instrument. This car has attracted attention wherever it has appeared, and has received a great deal of newspaper notice; and it is stated that the demonstration of safe driving speeds on the road, afforded by the car, has done more to affect public opinion in the direction of safe and sane legislation on the speed-limit for automobiles than any other influence.

The other demonstration auto is a large touring car with a delivery-wagon body of ample capacity. Placed midway of the body is a handsome octagonal glass dome, having at the bottom a conical bin connected to a small blower operated by the engine of the car. By means of a friction clutch controlled by a foot-lever, the driver at intervals causes a geyser of puffed rice to burst up into the dome. This performance graphically illustrates the slogan of the company, "Foods shot from guns," to onlookers in the streets of the cities and towns through which the car operates. There are at present four of these cars operating in different sections of the United States, and they are reported to be stimulating sales of the product to a very considerable degree in the territory through which they are passing.

In another car operated by a steam-locomotive manufacturer who also makes automobiles, the advertising feature consists of a little locomotive standing on a section of track and having a tender and a flat car attached, the whole mounted on the bonnet. This miniature train is equipped with tiny electric lights, and its wheels are made to spin around by a small electric motor; and the flat car carries a reproduction, on a small scale, of a racing cup which was won by an auto of the company's make.

The Triumph of Intellect Over Instinct

The Modern Trend and Where It Leads

By Alfred J. Lotka

IN the popular mind instinct is a faculty essentially characteristic of the lower animals, and reason, in its full development, the prerogative of man. So much has this point of view been emphasized, that perhaps there is a tendency at times to overlook the very important part still played by instinct in human affairs. The infant in the cradle, with its mental faculties still dormant, is of necessity dependent on instinctive actions. A little later the growing child enters into that precious inheritance, his native tongue, by a process almost entirely instinctive. Language itself is the product, for the most part, not of conscious design and systematic plan, but of natural evolution operating through instinct. The love of cleanliness, our sense of decency, of right and wrong, all these are innate instincts, whose power for good in the building up and maintenance of well-regulated human society is too obvious to call for further comment.

Instinct, however, has its limitations. Thus, for example, we should have been better served if, instead of a Babel of tongues, one only, or at any rate but a limited number, had developed. The recognition of this fact has caused several enterprising spirits to undertake the task of composing and launching upon the world an artificial language, which should serve for universal interchange of thought among the people of all nations. To some minds this idea appears at first sight fantastic, unnatural. They have been accustomed to regard language as an essentially spontaneous and natural product, and the idea of "making" a language seems to them absurd. As a matter of fact, the language of every modern civilized nation includes a large number of artificially contrived words. The progress of our times has been so rapid that words had perforce to be made to name our new acquisitions. It may be urged that an effort has been made to coin such words as far as possible in accordance with the laws of philology. This is admitted; but in no wise alters the fact that the words have been deliberately "made," by the conscious application of a prearranged plan. Whether the plan chosen is that which satisfies the fastidious ear of the philologist, or whether the word is coined regardless of any such niceties, with the mere commercial object of attracting attention and advertising, or whatever the method selected, the fact remains that the arbitrary coining of words by a deliberate and conscious act is not by any means the practice exclusively of the inventors of Volapuk, Esperanto, Ido, or the like, but is a matter of everyday occurrence, sanctioned by usage and justified by practical results. Probably the most thoroughly worked-out system of word coining is that upon which the nomenclature of organic chemistry is framed. The systematic name of an organic compound gives to the initiated a vast amount of information regarding the relation of such a body to other compounds, its probable modes of origin, products of decomposition, and many other properties. And these terms are practically international, intelligible alike to English, French, German, and others. It can hardly surprise us, then, that among the most noted supporters of the movement for an international language we find the great German chemist and philosopher Wilhelm Ostwald.

Whether this movement be doomed to failure or destined to succeed, it represents a tendency characteristic of our time. In it we see a deliberate attempt to substitute in place of the "natural" product evolved by instinct, a product of the intellect, designed with forethought and on a scientific plan, with the definite purpose of avoiding some of those difficulties into which the operation of instinct in the formation of language has driven us.

A similar influence is seen at work in the domain of the other fundamental instincts of which mention has been made above: our sense of cleanliness, propriety, and moral rectitude, those safeguards of the physical, mental, and moral welfare of the community.

These three instincts, or perhaps rather groups of instincts, stand in an obvious and close relation to one another. It might be said that there is a certain gradation from the first to the third. Furthermore, each of these instincts is known to us in two modes of manifestation. In the spectator any offense against the laws of cleanliness, decency, or morality calls out feelings of more or less disgust, indignation, or condemnation. This might be termed the "active" mode of manifestation of the particular instinct. The offender, on the other hand, especially if he becomes conscious of exposure, experiences embarrassment, confusion, shame, a sense of guilt and of disgrace, as the case may be, or a combination of such feelings—the passive mode of manifestation. There is a desire on the part of the offender to withdraw from the public gaze, to seek seclusion. The spectator, on the other hand, turns away in disgust, perhaps flees from the scene, or in more extreme cases, especially of moral offense, may seek to inflict punishment upon the offender, or even to destroy him. In brief, the function of these instincts is to temporarily or more or less lastingly isolate the offender, or even to extirpate him from the community. We might describe them as "quarantining" instincts. They represent the often somewhat heroic measures adopted by primitive society to practice a kind of crude sanitation, forcing the temporarily noisome into seclusion, thus isolating them in some degree; eliminating permanently undesirable elements, and preventing objectionable propagation.

These quarantining instincts, like all others, have their obvious limitations. Efforts to remedy these defects are known to us from remote antiquity. The detailed injunctions of the Mosaic law, for example, based presumably upon empirical knowledge, are familiar to all, and have in their time served their purpose. But the systematic care of public health, physical, mental, and moral, on scientific principles, is a comparatively recent development. Indeed, especially in the matter of moral sanitation, hardly more than a crude beginning can be said to have been made. The great mass of the people in these matters still blindly follow the instinct which merely bids them visit "punishment" upon criminals. That the bias for crime is the most terrible misfortune which can befall a human being, that the criminal represents the foulest rankling sore of the very same community of which the self-complacent "respectable" citizen forms part, that the disgrace of this sore—if disgrace there be—falls perhaps quite as much on the respectable citizen as on the perpetrator of the crime, these are vital facts which the blind instinct to "punish" fatally disregards. There is need that the public conscience be aroused to that clearness of vision which will make the people feel the execution of a criminal as a most painful operation, the removal of an offending member from their very body—to be resorted to only in a last extremity. It is true that much progress has been made since the middle ages, and even within the last century. No longer do public executions furnish a spectacle for the abominably depraved appetite of the populace.

We no longer as a State countenance undisguised torture. In a number of countries the capital penalty has been abolishd. Much has been done for the prisoner and the ex-convict. But still more is left for further development. And in what direction is this development to proceed? Is our sense of right and wrong to be stamped out or set aside? And if so, what is to take its place? Let us see what answer we may obtain to these questions in the light of our previous reflections.

Consider the instinct which makes us shrink from contact with noisome things, vermin, diseased matter, and so forth. A most healthy instinct surely. Yet the biologist, the physician, must allow his reason to supersede this impulse, and does so not only without harm to himself, but with possibilities of incalculable benefit to the human race. Once the intellect has clearly grasped the true source of danger, the blind instinct becomes not only unnecessary, but may even at times work to our disadvantage. Are we therefore to throw aside our instinct of cleanliness? Surely no. Nor is there any tendency, as the people become intellectually enlightened as to the true danger of unclean surroundings, for the natural love of cleanliness to flag, but quite the reverse. The average man of our day has a much keener sense of these things than prevailed of yore. No; not by stamping out such instincts shall we progress, much rather by intensifying them—but always under the control and guidance of reason, and with the fullest understanding at our command of their true relation to natural phenomena.

And precisely the same holds true with regard to our moral instinct. In studying crime and the methods of treating that disease of the community, let us proceed with the same dispassionate spirit of scientific interest with which the student of biology dissects some ungainly creature, or the pathologist handles some repulsive product of disease. This need not in any way lessen our innate shrinking from evil, but rather, we have every reason to believe, will it sharpen our sense of good and evil, deepen our sympathies, render us more conscious of our own shortcomings, and make us gentler judges of those unfortunates whom birth and circumstances have predisposed to evil, those weak members of society in whom the venom of the petty transgressions of their stronger brothers gathers into festering sores and breaks out in fatal eruptions.

We have seen the physical welfare of the nations vastly benefited by the development of a rational system of public sanitation. The blind instinct, working fitfully and uncertainly, the empirical law, mysterious, imperfectly taught and often disobeyed, because not understood, have yielded a place to the promptings of science, clear, appealing directly to the reason, willingly followed when once recognized. Isolation of diseased persons, and proper disposal of noisome waste matter, urged upon us by instinct, and enjoined by empirical law, we still find it expedient to practic under the guidance of scientific enlightenment, but with redoubled effectiveness and by more humane methods. The regulation of the propagation of our kind is still left almost entirely to instinct and empirical law, for the discipline of eugenics, urged by the late Sir Francis Galton and his followers, is as yet hardly more than a name. And we are only just learning to recognize the fact that in public morals, too, the uncertain indications of instinct can be greatly cleared and strengthened by a thoughtful and sincere application of rational analysis and scientific method to the problems involved. But the modern trend moves on toward a clearer view and better practice, with instinct and intellect working together for good, each reinforcing the other, the one more primitive, more spontaneous, the other more secure, more convincing in its indications. And thus we rise to better things.

The Over-rated Savage Vision

MORE or less wonderful acounts have from time to time been given of the powers of vision possessed by savage races. During a British anthropological expedition to Torres Straits, the visual acuity of the natives was carefully tested, and from these tests the conclusion was reached that the excellence of vision shown by savages has a psychological origin; that is to say, it arises from knowing what to look for. When the civilized man acquires familiarity with the environment he can see as far as they can. Thus the power of an Indian to tell the sex of a deer at such a distance that distinguishing features like antlers were invisible, was found to rest upon his knowledge of the peculiar gait of the male deer.

Correspondence

Dreadnoughts versus Pre-dreadnoughts

To the Editor of the SCIENTIFIC AMERICAN:

On the advice of a friend in the Bureau of Construction and Repair, I send you the following—the object being to bring the matter before the largest number of readers, in order that the error herein set forth may be corrected. I have been told that this argument of the great superiority of the dreadnought type over the older battleships mounting a less number of guns, owing to the shorter battle column, was first advanced by Capt. Sims of the navy, but I do not know whether this is correct. It is evident from an inspection of the diagram I send you that the argument, in the language of Prof. Tyndall, "does not subtend a visual angle."* In a late issue of the SCIENTIFIC AMERICAN you mention the usefulness of the pre-dreadnoughts in forming a reserve division, which could be pushed forward after the engagement of the more powerful dreadnoughts with the enemy. Why not advocate more vigorous tactics? Place the "antiquated" battleships in the front when the battle is joined, and let them reduce the modern dreadnoughts and superdreadnoughts of the enemy to a condition compelling them to seek their home docks for repair, and then bring forward your own dreadnought fleet to take command of the sea.

WALTER PROCTOR JENNEY, PH.D.
Washington, D. C.

The Law of the Air

To the Editor of the SCIENTIFIC AMERICAN:

The popular acceptance of the aeroplane as a means of locomotion, and the firm belief of some of our legislators in vast increases in the number of these vehicles in the near future, is already leading to the enactment of statutes relating to their registration and regulation. Bills pertaining to aeroplanes have been prepared both in Connecticut and California, that in the latter State even specifying the lights to be carried. (See *Aeronautics*, March, 1911.)

The aeroplane will doubtless be capable of speeds far exceeding the road speed of the automobile; and to it for this reason, as well as the impossibility of marking the illimitable aerial highways, State boundaries will be definite only so far as they are geographically evident. State regulation of the aeroplane spells a far greater nuisance, and leads to even more inconvenience, than does the State control of the automobile, the transfer of which to federal authority is occupying so much thought and attention of prominent members of the automobile fraternity at the present time. Again, the State has not the legitimate claim to license fees for aeroplanes that it has for automobiles, based upon a damaging influence upon the roads.

Let us have uniform laws for our aerial fleets, as we have a uniform marine code in all adjacent waters; and if State registration of aeroplanes is advisable for jurisdictional purposes, let it be, in all States, a uniform process, with a uniform registration fee, and being duly registered let the aeroplane be free to pass across State boundaries, unhampered by local checks or regulations.

If the foregoing be accomplished in these early days of aviation, the troublesome lesson of automobile registration will have served a useful purpose—the precluding of difficulties in one phase of interstate commerce, the extent of which is only a matter of conjecture.

W. R. M. VERY.

Ithaca, N. Y.

* Belfast address.

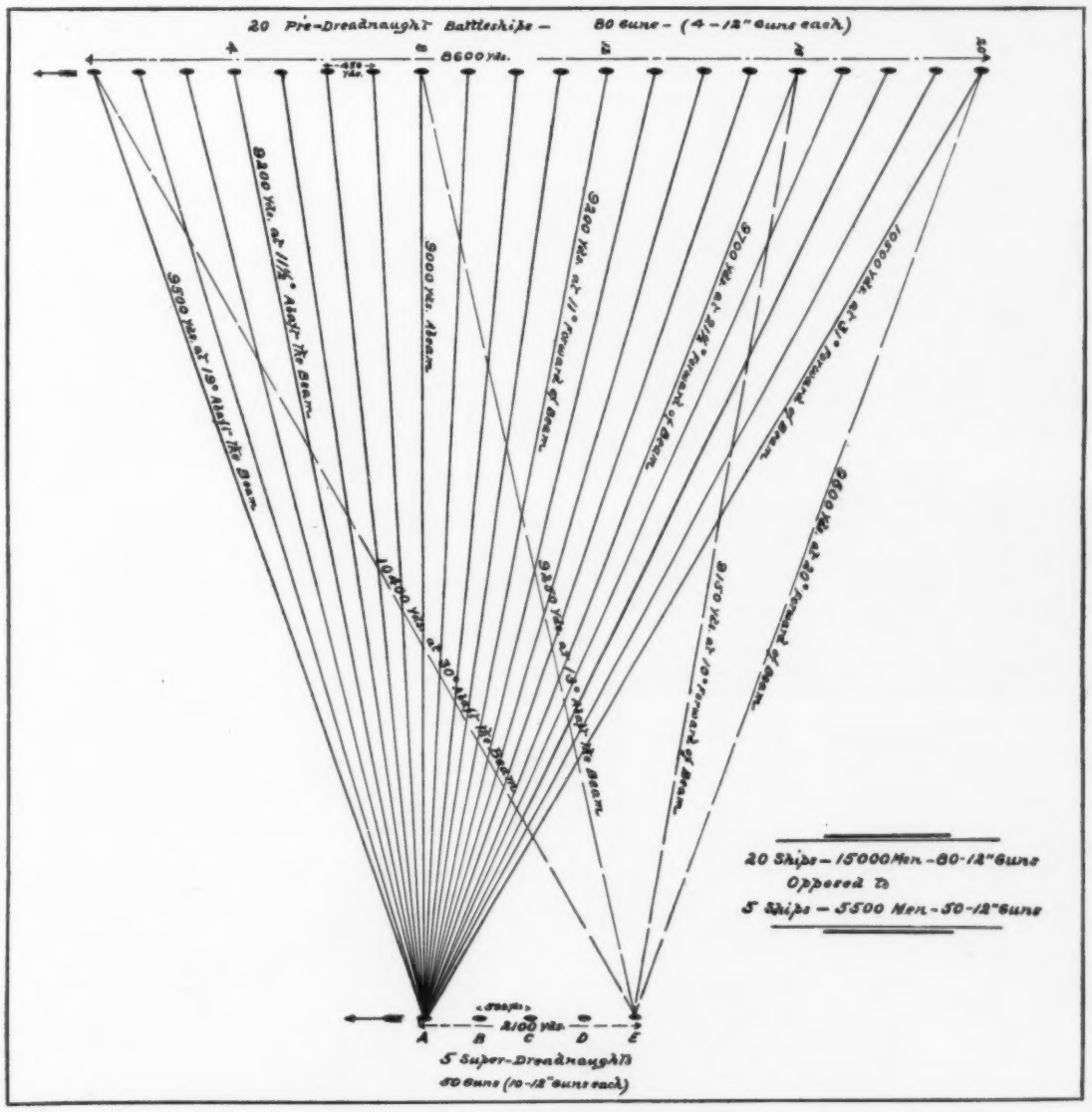

20 Pre-Dreadnaught Battleships — 80 Guns — (4 — 12" Guns each)
8600 yds.
9200 yds. at 11½° Above the Beam
9000 yds. Abeam
9200 yds. at 11° Forward of Beam
9700 yds. at 11½° Forward of Beam
10500 yds. at 12° Forward of Beam
10500 yds. at 30° Above the Beam
9000 yds. at 13° Above the Beam
9700 yds. at 10° Forward of Beam
9800 yds. at 20° Forward of Beam
20 Ships — 15000 Men — 80-12" Guns
Opposed to
5 Ships — 5500 Men — 50-12" Guns
2100 yds.
A
B
C
D
E
5 Super-Dreadnaughts
50 Guns (10-12" Guns each)

Diagram of an engagement at 9,000 yards between five super-dreadnoughts carrying fifty 12-inch guns and twenty pre-dreadnoughts with eighty 12-inch guns.

The Thaddeus Stevens Industrial School

We have received from Mr. William Mellor a letter which we publish below. We have much pleasure in giving publicity to this communication in our columns. Helping others to help themselves is the best form of philanthropy. Even from the purely commercial standpoint of public economy, such measures represent a most paying investment, making good citizens of persons who would otherwise, often through no fault of their own, be in danger of becoming a charge and a dead load upon the community.

We may add to the statements made by Mr. Mellor in his letter, that, according to a circular issued by the Industrial School, admission of new scholars is made in April, an examination for admission being held about four months previous to this period. The subjects are reading, writing, arithmetic, geography, United States history, and composition. For further particulars address the school.

Mr. Mellor writes:

To the Editor of the SCIENTIFIC AMERICAN:

We are subscribers to your valuable journal, and I have thought that you might find it convenient through the medium of its columns to bring our school to the notice of poor boys in the State of Pennsylvania.

The Thaddeus Stevens Industrial School is located in the city of Lancaster in Lancaster County. It is now engaged in teaching the following trades: Bricklaying, carpentering, patternmaking, and the machine trade. Boys to be admitted must be 16 to 18 years of age, having a common school education, of good moral character, and residing in this State.

Poor orphan boys have the preference in the choice of admission. The course will require three years, during which time they are given clothing, board, lodging, one of the trades above mentioned, together with a good high school education.

Knowing of the large circulation that your publication has among drawing rooms and shops, master mechanics, and workmen, I hope that it may reach those who know of some deserving boys who would be glad to avail themselves of just such advantages.

Hoping that this will meet with your favor and notice, I remain, Respectfully yours,

WILLIAM MELLOR, Superintendent.
The Thaddeus Stevens Industrial School.
Lancaster, Pa.

Why Not Use the Moon to Drive a Machine?

To the Editor of the SCIENTIFIC AMERICAN:

The writer of this letter lays claim to advancing no new idea, but believes he is possibly presenting old ideas in a new light. The object being to divert a portion of a large amount of gray matter which is running to waste into a channel where it may eventually help turn the wheels of progress.

Reference is made to the immense amount of mental effort expended on perpetual motion machines. My understanding of such a machine is one which gets its impetus from some natural force which is forever active.

It is well known that a great many of these machines are founded on the assumption that it is possible for a ball in descending from one plane to another to develop more than enough energy to wriggle and twist a similar ball from the lower plane to the upper; the more complicated efforts appearing like attempts to sneak the ball up without the attraction of gravity catching them at it. As gravity has never as yet been caught napping, up to the present time there have been no successful machines recorded.

But gravity is not the only force which is forever active. The attraction of the moon for everything on this earth is just as unremitting, with the great disadvantage that it is not so appreciable, and with the great advantage that it acts from different directions at different times. An immense pendulum would oscillate in accordance with the position of the moon, but it would have to be housed on account of wind currents, and I never found in my astronomy a formula for computing how many miles high the building would have to be in order for the movement to be visible to the naked eye. But given such a building and such a pendulum, a machine, deriving its impetus from this pendulum and storing enough energy to keep it going during the time the pendulum would be comparatively at rest, would be as truly a perpetual motion machine as if it derived its energy from gravity.

Nature has furnished us with several great pendulums in the oceans. A machine attached to these pendulums, which shall store enough energy to keep going while the tides are at rest, cannot possibly be disqualified as a perpetual motion machine merely because nature furnished us the pendulums. The men who are attempting to harness the tides are really experimenting with perpetual motion machines. Those inventors who are experimenting with perpetual motion would do well to devote their energies to making practical use of something which we have.

Amsterdam, N. Y. A. F.

The Largest Hydraulic Turbines in Existence

The White River Hydraulic Electric Development

By Barrett Smith

TWENTY-FIVE miles southeast of Seattle and ten miles east of Tacoma there is a ridge which rises very abruptly to a height of about 600 feet. Beyond this ridge and stretching away eastward to the White River there is a high and slightly shelving plateau. Lake Tapps, a large natural basin, is located on this plateau less than two miles from the western base and some 440 feet above it.

The present development takes advantage of this remarkable situation by diverting the waters of the White River at a point eleven miles distant, conducting them northwesterly across the plateau and storing them in Lake Tapps, from which, by means of a tunnel through the western ridge and penstocks on the western slope, they will be discharged down to the power house in the valley. An immense volume of water will be stored. The water above the outlet gates, that is to say, the water that could be drawn off to generate power, would cover a square mile to a depth of 100 feet. This great reserve will give the White River plant the unique distinction among large developments of the country of being able to operate at a capacity of 35,000 horse-power for an entire month independent of inflow, and allowing for seepage and evaporation.

In addition to Lake Tapps, with its ultimate area of 3,000 acres, there will be five basins impounding water at points along its course from the White River to Lake Tapps. The White River drops away to the northwest from the point of intake, and a series of flat benches some two miles long is formed along the brow of the plateau. Embankments all along the north or valley side of these benches will transform them into a chain of four basins, the points of land which separate them being cut by canals. The westernmost of these basins is being connected with Lake Tapps by a five-mile canal which, at a point near its center, passes through an open valley between embankments over one-quarter mile long and 650 feet apart, affording the fifth auxiliary storage basin.

Just before entering this basin there is a fall of 90 feet in a distance of one and one-half miles, making possible an auxiliary development here of 3,500 horse-power at comparatively small expense should it be desired in the future.

To complete the ends of the waterway, of which simply the central portion has been described, there is a timber flume and wood-lined canal 1.1 miles long at the upper end connecting the intake with the chain of basins, while at the lower end there is a 2,000-foot canal and a 3,000-foot tunnel connecting Lake Tapps with the pipe lines on the slope above the power house. The pipe lines are 2,200 feet long and lie on a slope of one foot in five.

While preliminary work on the development was done in April and May, actual excavation was not begun till well into June. Nevertheless, on January 1st 720,000 yards of earth had been removed. This was the work of five steam shovels and represents an average output of a train of standard railroad cars over a mile long each day for six days every week since the excavation was begun. These figures are difficult to comprehend, but they mean a total of some 26,000 carloads, or a solid train 170 miles in length. The 720,000 yards is more than half the total excavation, which will be about 1,300,000 yards, and shows in general what progress has been made.

Among the other things already done that do not show in the statement of earth removed or embankments made, are the following: The main dam and piling for wing wall; about 25,000 yards of concreting at the headworks; some 3,000 feet of twelve-foot tunnel; and over two million board feet of timber cut and sawed by the constructor's sawmill on Lake Tapps for dump trestles, flume, tunnel timbers and canal lining. This sawmill cuts 50,000 feet of timber a day from the logs. It will be required to cut a total of 20,000,000 feet, which would build a five-foot sidewalk extending from Seattle to New York.

There was also extensive preliminary work, which in point of time consumed was charged against the job at the outset, but which serves the job all the way through, so it should be deducted from the time to date and distributed over the whole period of construction. This work includes 5½ miles of standard gage railway spurs connecting with the Northern Pacific Railway at the power house and at the headworks. It also includes near the power house a permanent incline railway one-half mile long equipped with a large electric hoist that hauls up the standard gage freight cars and their heaviest loads with ease. The hoist receives current over a 2,200 volt line from a construction substation near the power house site, which contains 2,200 kilowatt transformers. The transmission line continues on to Lake Tapps where it supplies the sawmill, and now is coming into additional use for the construction of the power house itself, a motor driven double centrifugal pump being installed at Lake Tapps with a 12-inch pipe line 7,000 feet long over the ridge for hydraulically excavating the foundations and for supplying water to the gravel washers.

The main equipment of the power house has been ordered. It will consist of two 18,000 horse-power single runner, double discharge, Francis type turbines, each coupled to a 10,000 K. V. A. 6,600-volt generator. There will be two banks of transformers stepping the current up to 60,000 volts for transmission.

Christening the "Suchard"

The Airship Which is to Essay a Transatlantic Crossing in the Trade Winds

By Carl Dienstbach

ON February 15th, Joseph Brucker's airship "Suchard," destined for the transatlantic trade winds expedition, was solemnly christened by Princess Henry of Prussia. The ceremony was almost identical with the familiar scene at the launching of a steamer. But while the "flotation" of a sea-going vessel is perfect at that stage, and its mechanical equipment quite rudimentary, exactly the reverse was the case with the airship. It was complete, but not quite ready to rise, being only partially inflated.

All details were open to inspection. The weights of the several parts are as follows: Envelope, 2860 pounds; ballonette, 770 pounds; rigging, 440 pounds; belt to which the suspension "crowsfeet" are attached, 176 pounds; rudder and stabilizing planes, 440 pounds. The maneuvering gas valve has a diameter of 33½ inches; the two safety valves each of 29½ inches. The car (motorboat) is suspended by fourteen wire cables, each fastened to a system of seven "crowsfeet," the typical Parseval suspension. A quantity of 3,740 pounds of gasoline is carried in seven tanks in the bottom of the boat, and about 650 pounds of oil is taken along in cans.

The propellers are of wood and measure 9.8 feet in diameter. They are mounted in a bearing frame built of seamless steel tubing. The two 100 horse-power motors are placed in the rear in line with the keel, the two flywheels facing each other. They will be used only alternately during the trip, thus affording a strong guarantee of reliability. They run at 1,000-1,200 revolutions a minute, imparting to the propellers, through chain gearing, a speed of 800-950 revolutions a minute. The one engine can be coupled to the motorboat's water propeller. An enormous radiator is placed above the transmission, between the motors. The blower for the air ballonette, driven by transmission from either of the main engines or by a 4 horse-power donkey engine, or by hand, sucks its air through the radiator, thus providing especially efficient cooling.

The runway for reaching the envelope and the valves is suspended directly to the former by special tackle, in the Parseval style. Beneath it the running weight is carried on a cable. There is a ripping panel that may prove hard to tear open after a trip of a week's duration has hardened the glue, such panel being properly a device designed for the ephemeral "sphericals."

There is an interesting plant for electric lighting, including searchlights, current being supplied by a storage battery that weighs 308 pounds, but of which 110 pounds is arranged to be dropped as ballast after exhaustion. These batteries, as well as the meteorological, nautical, and aeronautical instruments, are lent to the expedition free of charge. The water spraying device is operated from the captain's "bridge." It can be easily and instantaneously worked by hand, spreading the water in a very thin film over the envelope.

The "scoops" for taking in water as ballast are made of sheet steel, each about 28 inches long. Owing to their fishlike shape they slip through the water with but little resistance. After filling through one of the four holes the shell automatically turns around to allow the water to enter through the next hole, until the entire scoop is full. A special kind of windlass operates these scoops, which can be dropped through a distance of 500 feet.

In some experiments recently carried out in the Kiel harbor, in which an equilibrator of the Wellman type was dragged behind a torpedo boat, the resistance of the apparatus was found to be quite excessive.

The problem of launching the motorboat on the ocean has been worked out quite carefully. Ten of the suspension ropes are cast loose in the air; the four remaining ones are all slipped at the same instant by a special apparatus the moment the boat touches the water.

On the occasion of the christening ceremony the interior of the big airship house at Kiel was all decorated with flags and pine branches. Music was provided by the naval band of the Emperor's yacht "Hohenzollern." Among the guests assembled were Admiral Lans, the members of the expedition, the Mayor of the city of Kiel, other members of the municipal council, the local government authorities, and a great number of naval officers. Presently Prince and Princess Henry of Prussia arrived, and after exchanging the usual greeting, ascended the richly decorated christening platform erected in front of the boat's bow, just as is the custom for launching ships. Mayor Lindemann, of Kiel, who is also president of the Kiel section of the Society for Motor Aeronautics, delivered the christening speech. He recalled the earliest expeditions to America by water, first by the Norsemen about A. D. 1000, and later by Columbus some 400 years ago. After reviewing the progress of water navigation, he passed on to speak of the present project, dwelling on the fact that the idea which Mr. Brucker had proclaimed with unwavering zeal and unflinching courage, and at much personal sacrifice, had been taken so seriously by the best aeronautical and meteorological experts of his country, and had been matured by them with so much of the proverbial German thoroughness, that it could not fail to finally convince even the most skeptical.

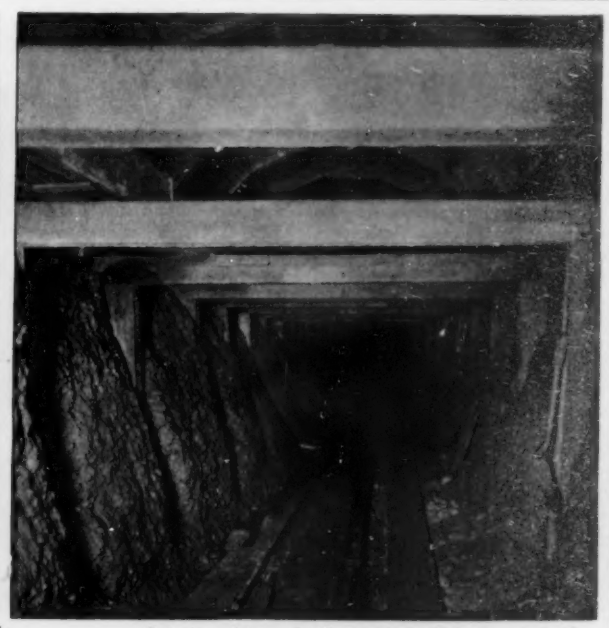
He then praised the members of the expedition for the courage in their convictions which they displayed, being prepared at great personal risk to prove the correctness of the underlying theories and the scientific and practical importance of their plan. He wished the enterprise success "for the honor of German science, German thoroughness and German skill." Then Princess Henry broke a bottle of champagne against the "Suchard's" bow, with the words, "I christen thee with the name of 'Suchard,' and wish thee a prosperous voyage."

The ceremony closed with some remarks by Dr. Gans Fabrice, president of the expedition, three cheers for the Kaiser, and the playing of the national hymn by the Imperial Band.

Special Food Investigations

CONDITIONS revealed in the course of the enforcement of the food and drugs act often make it advisable to undertake special examination of the process of manufacture and subsequent handling of various products affected by that act. Such investigations have been conducted in the case of fruit products, dairy products and poultry, and fish and oysters. Researches of a purely scientific character for the purpose of developing new or improved processes have also been undertaken.

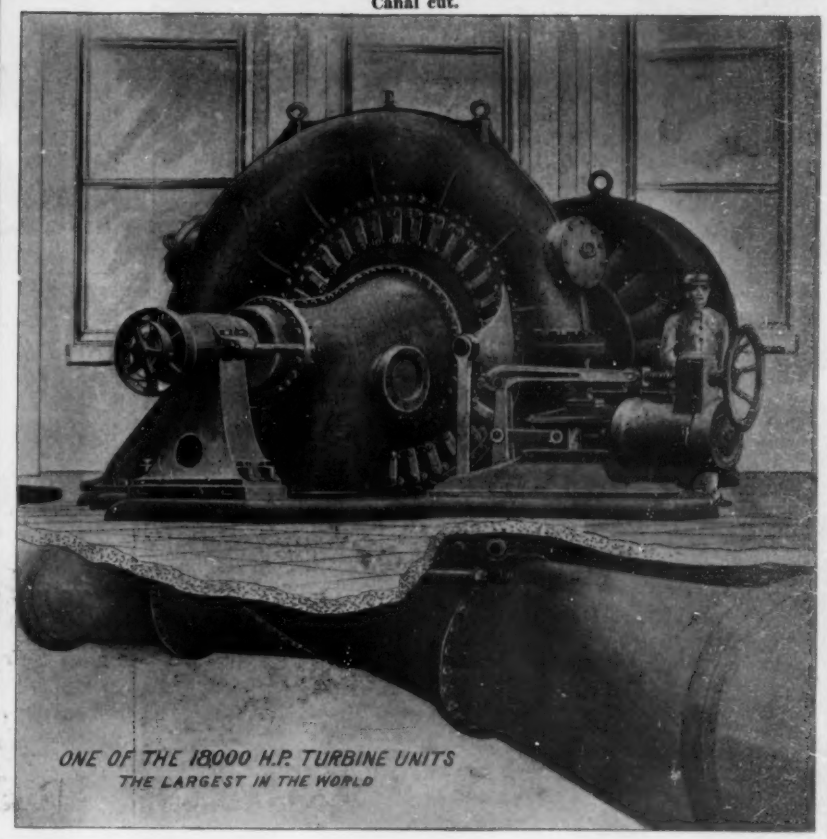
Dam and wing wall.



Interior of tunnel (above power house).

Incline railway (above power house).

Canal cut.



THE LARGEST HYDRAULIC TURBINES IN EXISTENCE

New York's Automobile Fire Service

Another Step Toward the Retirement of the Horse

By Herbert T. Wade

WHEN a procession of motor-driven fire apparatus rolled out of the doors of the repair shops of the New York Fire Department recently, it was quite evident that automobile equipment for fire protection was firmly established and had passed any experimental stage. On this occasion were shown the new motor-driven steam fire engine, the remarkable water tower recently described in these columns, two large size automobile hose tenders for the high pressure service, a small size automobile hose tender, and two supply wagons which can be used at large fires to transport coal from the fuel depots to the engines at work. All of these were in active operation, and not only did they exhibit greater speed and power than horse-drawn apparatus, but records and tests of apparatus already in use had demonstrated their economy of maintenance and operation, the saving being in most cases sufficient to pay the cost of new apparatus within a period of four or five years at the most.

With much of this apparatus the readers of the SCIENTIFIC AMERICAN are now familiar, with the exception of the new gasoline propelled steam fire engine which is attracting the widest attention. Its recent trial was watched by representatives of many cities, one engineer being sent to New York from Los Angeles for that purpose.

It must be recalled that the fire engine is essential in New York in districts where there is no high pressure service sufficient to send a stream of water from a hose nozzle to the top of the highest buildings. As it will be many years before such a system of independent mains and hydrants will be installed in large cities, it is still necessary to develop fire engines on the score of economy and efficiency. The first step in this motor age is to remove the horses, which must be fed, shod, and otherwise maintained whether the apparatus answers nine or nine hundred alarms a year. Furthermore, the drawing power of the horses is limited, and a three-horse team can handle only a certain weight with the possibility of a fall on snow or icy pavement. Many years ago

Fire Commissioner Waldo at the steering wheel of the new gasoline-propelled fire engine.

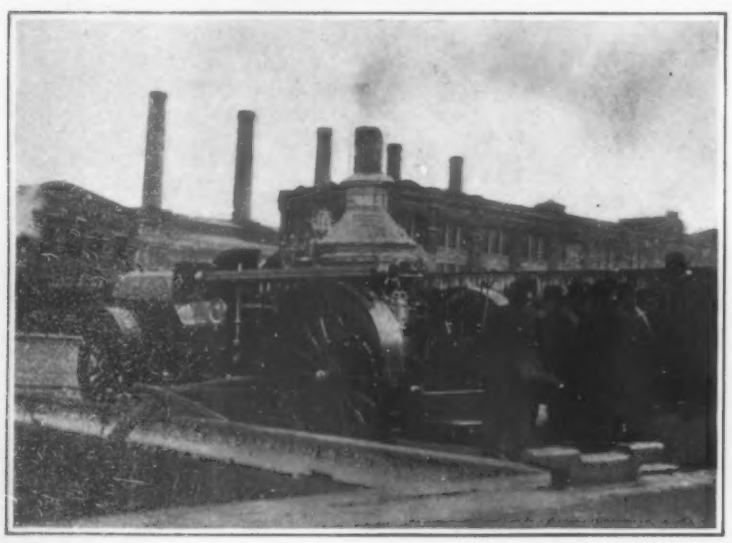
steam propelled fire engines were used and abandoned. Those present at the recent trials recalled one or two such machines used by the New York Fire Department which used to clatter over the cobble stones, pouring out black smoke and often glowing sparks. The improvement of the automobile engine and its application to heavy trucks naturally suggested its application to the needs of the fire department. True, there had been evolved a gasoline pumping engine which had been installed on a high speed chassis more or less resembling that of a touring car, but this type of machine, useful for the suburbs, until very recently had hardly reached a point where the capacity and reliability of the pumps could be considered as demonstrated when compared with the steam fire engine. In other words, the steam fire engine was a known quantity adapted to present systems of water supply and hydrants, and capable of being readily transported and put under steam, so that it would give efficient service at the fire.

Speed, power and economy, then, could be secured by adding mechanical propulsion, and existing practice need not be interfered with by any change in the boiler or pumping machinery. This was what was done in the engine for the New York Fire Department shown in our illustration with Commissioner Waldo at the steering-wheel. A new second-size engine had recently been delivered to the department. Its builders, who had been experimenting for several years on this problem, made the proposal to take the steam engine back to their Minneapolis shops, lengthen the frame in front and install a gasoline engine with chain drive to the rear wheels. Nothing else was to be done; boiler and pumping engine were retained in their original condition, and the only innovation was the arrangement of the motor and the front wheels—all well shown in one of our photographs. Under the bonnet is to be found a four-cylinder four-cycle engine arranged in units with valves in the head and a long stroke, capable of developing 110 brake horse-power. In building the engine the aim was to get away from

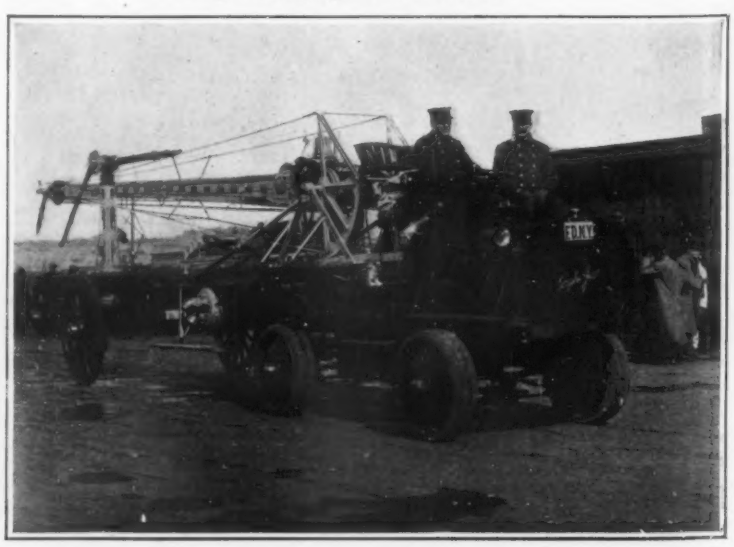
(Continued on page 315.)

Automobile hose tender.

Large size high pressure hose tender.



Testing pumping capacity of gasoline-propelled steam fire engine at river front.



Couple-gear motor driven water tower.

FIGHTING FIRE IN NEW YORK WITH AUTOMOBILES

Head Noises and How One Scientist Studies Them

Dr. Marage's Wonderful Machine

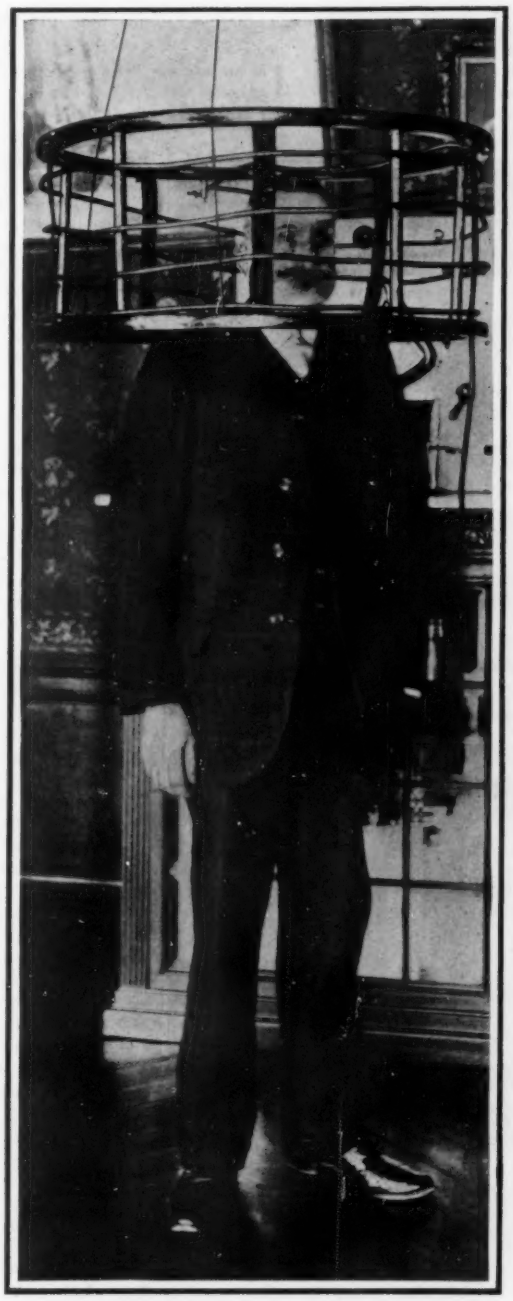
By Jacques Boyer

IN certain diseases of the ear, the patient hears sounds that have no objective existence. Dr. Marage recently communicated to the Paris Academy of Sciences the following results of his study of these subjective sounds.

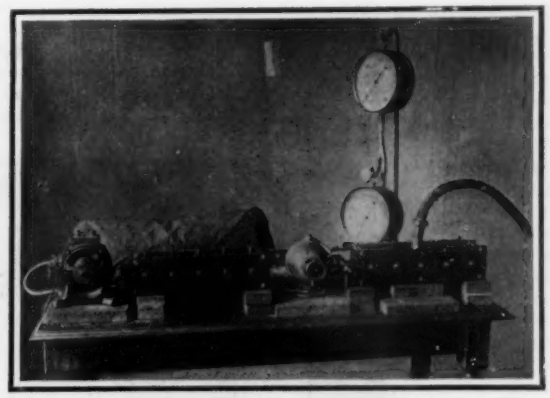
The sounds may be divided into three classes: Noises, musical notes and words or vocal cries. Among the commonest of the noises is a hissing or whistling sound of very high pitch, beyond the limit of the musical scale, which the patient compares to the hissing of gas escaping through a small orifice, the whistling of the wind under a door, or the sound heard when the ear is applied to a telegraph pole. Then come, in order of decreasing frequency, the beating of the pulse, the chirping of crickets or cicadas, the rustling of leaves, the crackling noises of the telephone, the measured tread of a troop of soldiers, and various strange noises, which patients have likened to the meeting of railway trains under a roof on which heavy rain was falling, the rumbling of a receding cart, the shuffling of a pack of cards, and the rolling of thunder.

The musical sounds are less varied. The patients seem to hear sleigh bells, electric bells, drums, trumpets, organ pipes, church bells (usually cracked) and the songs of birds. Some patients fancy themselves in an aviary filled with birds of all kinds, while others hear for months tunes which they know very well, but which they cannot repeat.

Words and vocal sounds constitute the third class of subjective sounds. The patient hears the croak of a frog (the vowel sounds ah and o), the cuckoo's note (oo), spoken words which are always the same but which cannot be recalled, the shouts of an infuriated mob, etc.

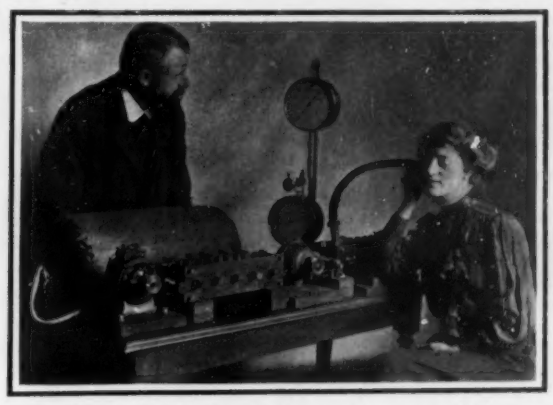


Application of high-frequency currents for the cure of abnormal hearing of the pulse-beat.



Dr. Marage's vowel-producing siren.

Vibratory massage for the cure of subjective sounds.



Treatment of subjective hissing sounds by means of low, sonorous vibrations.

DR. MARAGE'S WORK

Dr. Marage examined 1,000 cases of chronic deafness, of which 37 were in deaf mutes, 151 were due to former ulcerations of the ear, and 812 were caused by sclerosis, or hardening of the auditory organs. None of the deaf mutes was troubled by subjective sounds, and only about 10 per cent of the victims of ulceration complained of such sounds which, in these cases, assumed the forms of whistling, the roaring of sea shells, the songs of birds, and the ringing of bells.

Of the victims of sclerosis, 37 per cent were free from subjective sounds, 16 per cent complained only of whistling or hissing, 18 per cent of whistling accompanied by other sounds, while 32 per cent heard no whistling, but did hear various other sounds, most frequently those of bells, shells, birds and the beating of the pulse. Whistling is the only subjective sound that occurs alone, Of the other sounds, two or more are always associated, not only in the same patient, but at the same time.

Dr. Marage gives the following explanations of these pathological subjective sounds:

The whistling sound is caused by a displacement of the stirrup, one of the series of three small bones by which the vibrations of the ear drum are communicated to the inner ear. This view is confirmed by experiment, for the whistling sound is heard by a normal person in whom the stirrup has been displaced by artificially diminishing the pressure in the middle ear. This explains the infrequency of the whistling sound in deafness caused by ulceration which has produced a fissure connecting the middle ear with the external atmosphere. In this case the whistling sound could be produced only by the stirrup being fixed in an abnormal position by the healing of the wound, and this seldom occurs. The treatment of cases in which whistling is the only subjective sound heard is suggested by the facts recounted above. In order to suppress the whistling it is merely necessary to bring the stirrup gradually back to its normal position. This result can be accomplished by means of sonorous vibrations of small intensity which displace the stirrup by less than one thousandth of a millimeter (1/25000 inch).

For this purpose Dr. Marage employs synthetic vowel sounds of low pitch, produced by forcing air at low pressure through his well-known siren, which has already been described in the SCIENTIFIC AMERICAN.

For the suppression of the sound of the pulse, associated with disturbances in the general circulation of the blood, other methods of treatment are required. By a few applications of alternating electric currents of very high frequency (d'Arsonval currents) to the ear, Dr. Marage has relieved several patients of the circulatory trouble as well as of the annoying sound. The currents produce this result by acting upon the vasomotor nerves which control the circulation. For the treatment of the other abnormal sounds (which are not affected by the high frequency currents) Dr. Marage employs vibratory massage of the head at the level of the parietal and temporal bones. This treatment is successful when the trouble is of recent origin. Dr. Marage explains this result by the following theory: The abnormal sounds (except those due to displacement of the stirrup or to vasomotor troubles) are caused by a persistent excitation of the auditory nerve centers. For example, the sound of a bell is heard continually because the elements of the nerve fibers and centers, like the filings in a Branly coherer, maintain the conducting position which they assumed when the sound of a real bell was last heard. Dr. Marage is now engaged in ultra-microscopic researches designed to test this theory. He hopes to prove that solid particles of nerve tissue assume definite positions under the influence of sonorous vibrations, at least in the case of the lower animals. The verification of Dr. Marage's theory, however, is not required to establish the value of the simple methods of treatment devised by this eminent aurist.

The Current Supplement

IN the current SUPPLEMENT, No. 1838, we find a number of remarkable articles on technical subjects, of most diverse interest. Thus, Mr. Frank C. Perkins contributes an article on an English water dynamometer for absorbing 1,000-brake horsepower. — Passenger transportation has developed the most complex problem that is today presented to the engineer for solution. Its difficulties are very ably set forth in an article by Mr. J. Vipond Davies, under the title, "Construction of a Rapid Transit Railroad in Relation to the Handling of Passengers, as Illustrated by the Hudson and Manhattan Railroad."—Cement sidewalk paving is admirably described by Mr. Albert Moyer, of the Cement Users' Association.—Mr. Herbert L. Towle, in an article entitled "A Few Shop Jobs on an Old Car," tells how the wear due to use is made good, how old parts can be modernized, how an intermediate class of repairs, necessitated by such things as sagging of the frame or axles, or bends in the steering connections, may be remedied.—Modern scientific research is discussed by Sir William A. Tilden.—If you should wish to know just what the weather was doing on a particular morning at a particular spot on the land surface of the globe, the chances are about two in five that you could satisfy your curiosity by visiting a meteorological library and consulting its files of daily weather maps. In an entertaining article entitled "The World's Daily Weather Map," the whole subject is popularly reviewed.—William T. Serrill explains the value of illuminating engineering to the commercial man.

Science in the Current Periodicals

In this Department the Reader will find Brief Abstracts of Interesting Articles Appearing in Contemporary Periodicals at Home and Abroad

News from Venus

THE question whether other planets than the earth are inhabited has long interested astronomers and laymen. We know that the earth is only a comparatively small member of the solar system, and that the universe contains millions of suns which are probably surrounded by planets. Hence it appears very improbable that our little world is the only inhabited planet in the universe. As we know nothing of the planets revolving about other suns, let us confine our attention to our own solar system. If a planet has a solid crust which has cooled to a moderate temperature, and an atmosphere similar to our own in chemical constitution, if water is found on its surface, and if its superficial or atmospheric temperature does not for any long period rise above 100 deg. F. or fall below —20 deg. F., it possesses all conditions required for the maintenance of highly developed life, such as exists on earth. We know, indeed, that living organisms possess a very great power of adaptation to varying conditions; but it will be safest to confine ourselves to the limits given above.

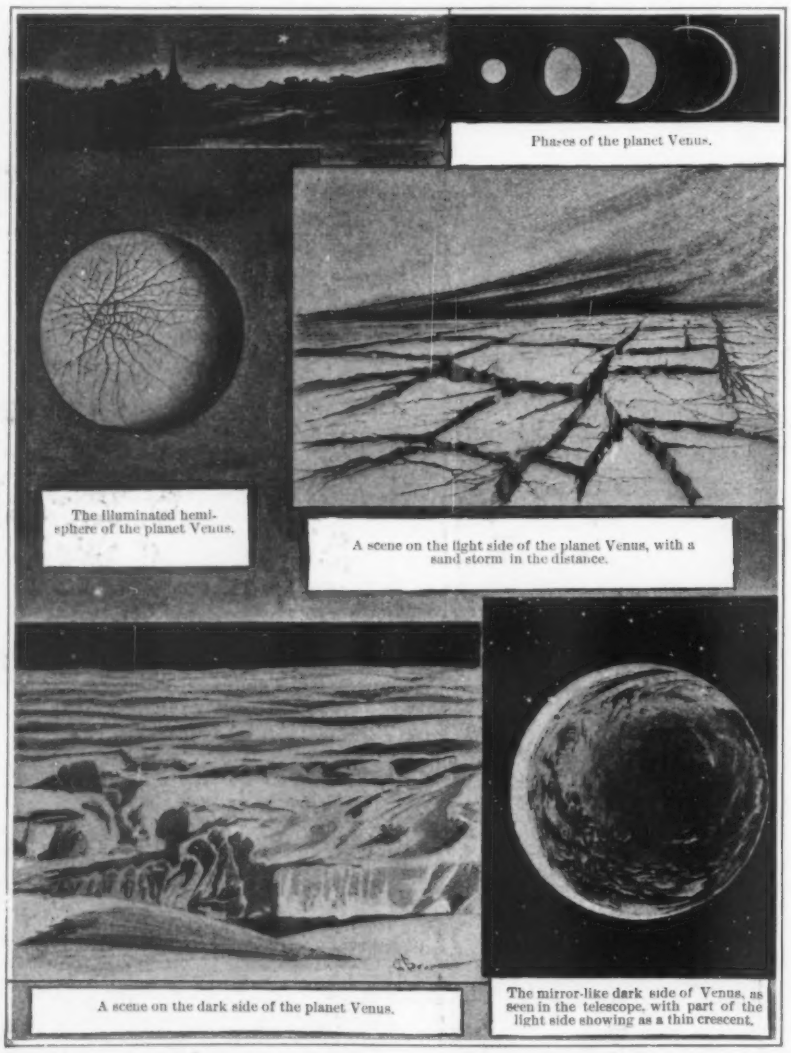
Mars and Venus are the only planets in the solar system which satisfy these conditions. The general appearance and configuration of Mars are very similar to those of the earth, and some astronomers are inclined to believe that Mars is inhabited.

How is it with Venus? asks a writer in *Reclams Universum*. This nearest neighbor of ours, which, however, is 25,000,000 miles nearer the sun than we are, and which performs its revolution around the sun in 224¾ days, he tells us, is not so accessible to observation as the exterior planets. "The angular distance of Venus from the sun is never very great. We see the planet now as a bright evening star in the west soon after sunset; again as a morning star in the east before sunrise. The wonderful brilliancy which makes this planet so beautiful is an annoyance to the astronomer, as it masks the fine details of the surface and makes minute study very difficult. As the planet, furthermore, is so near the horizon in the morning or evening that its image is distorted by refraction and obscured by haze, it can only be observed at all satisfactorily in full daylight. Venus is nearly as large as the earth and, as it is much nearer the sun, its temperature must be higher than that of the earth. The average temperature is estimated to be about 140 deg. F. Various phenomena appear to indicate that the planet is surrounded by a comparatively dense and cloudy atmosphere which, indeed, is apparently seen as a luminous border, in the transits of Venus over the sun's disk, which occur once or twice in a century. This dense atmosphere strongly reflects the sun's rays and thus prevents the surface of the planet from attaining a temperature too elevated for highly organized life. In addition to various pale and indistinct markings, bright spots, which may possibly represent snow, have frequently been seen at the poles of Venus. In consideration of all these things the planet would be regarded as habitable, except for the mystery which still surrounds its period of rotation.

"The rotation of a planet can be detected and measured by following the movement of the markings upon its surface. In this way we have learned that Mars rotates on its axis in 24½ hours, and Jupiter in 9 hours and 55 minutes. The markings of Venus, however, are not sufficiently distinct to enable the time of rotation to be certainly determined. Some astronomers have deduced a period of about 24 hours; but others, including Schiaparelli, have been led to conclude that the period of rotation is equal to the period of the revolution about the sun and is, therefore, about 225 days. If this is true, Venus must always present the same face to the sun, as the moon does to the earth, while the opposite hemisphere is exposed to eternal cold and darkness. Such a planet would evidently not be habitable, for the surface of the hemisphere turned toward the sun would be white hot and the other hemisphere would be intensely cold. Svante Arrhenius has pointed out that the plainly visible atmosphere of Venus affords evidence that the planet is not in this condition, for a permanent atmosphere can exist only on a planet which enjoys a regular alternation of day and night.

"Very interesting observations connected with this question have been made by the celebrated American astronomer, Percival Lowell, who is an acknowledged authority on the surfaces of the planets. From six months' continuous observation at his observatory in Flagstaff, Arizona, Lowell concludes that Venus always turns one face toward the sun, and also that the apparent high, dense and cloudy atmosphere has no real existence. The appearance of a strongly reflecting atmosphere is produced, in Lowell's opinion, by streams of dust. The illuminated face of the planet must be intensely hot, while the temperature of the opposite side of the hemisphere cannot be much above the absolute zero (— 273 deg. C. or — 459 deg. F.) On the illuminated side, the originally damp soil must now be dried out and cracked, and the opposite side is a desert of ice. This icy surface reflects the light of the stars and their images, which are frequently seen faintly when Venus, which passes through the same phases as the moon, appears as a thin crescent. On the unilluminated side of the planet, in consequence of the very low temperature, the air must be condensed and precipitated as ice, producing a diminution of pressure which causes air to flow from the illuminated hemisphere. This incoming air is in turn condensed, and so the process must go on until the entire atmosphere has been precipitated. This condition has already been nearly reached. The air, rushing violently from the light to the dark side of the planet, carries with it clouds of dry sand and dust, like the simoom of the desert. These dust clouds reflect the sun's rays and thus simulate a dense and cloudy atmosphere, and they also appear as streaks and spots.

"According to Lowell's recent observation, therefore, our beautiful neighbor planet must be as lifeless as our still nearer neighbor, the moon, and for the same reason."


Phases of the planet Venus.
The illuminated hemisphere of the planet Venus.
A scene on the light side of the planet Venus, with a sand storm in the distance.
A scene on the dark side of the planet Venus.
The mirror-like dark side of Venus, as seen in the telescope, with part of the light side showing as a thin crescent.

From Reclams Universum.

VENUS, IN THE LIGHT OF PROF. LOWELL'S THEORIES

George Westinghouse on the Future of Electricity

IN an address before the Southern Commercial Congress at Atlanta, Ga., Mr. George Westinghouse drew the following vivid picture of future possibilities of electric power:

"The application of power has been the fundamental factor in bringing about the characteristic conditions of the era in which we live. The steam vessel and the steam locomotive, by revolutionizing transportation methods, made possible the present development of our country. It is the power of the steam engine or the water-wheel which has substituted the power loom for the hand loom, with all the marvelous results which have followed. Similarly, throughout nearly every industry, human muscle is no longer the source of power, for the hand now directs and controls the untiring and unlimited power of great engines.

"Had a Jules Verne sought to imagine some universal servant of mankind, he would well have depicted some magic agent which would apply Nature's forces to do man's work; which could take the energy of her hidden coal, of the air, or of her falling water, carry it by easy channels and cause it to give the light of a million candles, the power of a thousand men, or to move great loads faster than horses could travel, to produce heat without combustion, and to unlock chemical bonds and release new materials. No such wonder was pictured by the imagination of the seers of the past; and yet a subtle force which transcends the powers of the imagination is daily doing all these things. First the toy, and long the mystery of the scientist, electric power is now a familiar tool for the accomplishment of the work and the increase of the comfort and pleasure of mankind.

"During the twenty-five years in which I have been intimately interested in the electrical art, a development has been witnessed which has surpassed the most optimistic predictions. Even before that period there had been operated electric arc lighting circuits of high voltage, extended over rather large areas, with the pressure upon the wires of from 2,000 to 7,000 volts, which practically demonstrated that considerable electric power could be cheaply transmitted if means could be found to utilize safely high-voltage electric current for power and light and for other purposes; but such means were not then known. It often happens, when something is greatly needed for any great purpose, that as a result of a lively appreciation by many of the existing need, there arises in due course invention or discovery which meets the demand, and so it was in the matter of invention and discovery which gave us a simple static device, consisting of two coils of copper wire surrounded by sheets of iron, which could, without an appreciable loss of energy, transform alternating electric currents of high voltage and small quantity, dangerous to life, into low voltage currents of large quantity, safely available for all power, light, heat and other purposes.

"To the part I took in bringing forward in the '80s of the last century the alternating current system of electric generation and distribution, I owe much, if not all, of the reputation accorded to me as one of the

many pioneers in what is now a great and important industry.

"As a result of the development of the alternating current and of years of experience in the manufacture of electric transformers and of insulators for supporting electric conductors, power is now successfully transmitted by alternating current over distances of two hundred miles or more. Thus water-power in almost inaccessible places awaits only the coming of engineers and of capital to be made available for industrial purposes.

"It is estimated by those who have made a study of the sources of water-power of the Appalachian mountains, that there can ultimately be developed from 5,000,000 to 7,000,000 horse-power during the dry season of the year, and a much larger quantity at other times. This great water-power is brought by nature to your mountains and hills in widely varying quantities and will continue indefinitely; but the maximum and minimum flow of the waters of your rivers can be affected by the works of man and by a wise conservation of your forests.

"Notwithstanding our familiarity with the present uses of electricity, few of us really comprehend how universal and fundamental is the part which electricity is destined to assume in the life of future generations. Electricity is a universal means of applying power for doing the physical work of the world. It is effective, not only in the application, but in the production of power. Less coal is required for producing electric power on a large scale than is required when many individual engines of smaller size are used. Water-powers which otherwise would be unavailable are made useful for supplying power to distant cities, and even a mill located at a water-power will give better service when it uses the electric drive. Electricity affords a simpler, better way of doing many things with which we are familiar, and it also makes possible new methods and new developments which, without it, would be impossible.

"With electric power the mill can draw its energy from any stream within a radius of a hundred miles or more; it may be located on high and healthful ground, on the outskirts of an established town or city where labor is plentiful and transportation facilities are the best.

"Furthermore, the use of electricity will conserve the coal deposits of the world for those industrial processes in the performance of which it may always be an indispensable element. To illustrate what a conservator of the coal resources of the country water-power may prove, I will only mention that to produce for ten hours each day from coal the five million horse-power which may be developed from Southern water-powers, would require, with the most efficient kinds of engines, not less than twenty-five million tons of coal annually. If there were no water-power available, methods would be adopted for producing power and conserving heat, which would effect a saving of over one-half of the coal now consumed in the world. Here is a field for agitation against waste of our natural resources surpassing all others in importance.

"Here are subjects not to be circumscribed by the wisdom and judgment of one man, but calling for the united counsel and effort of the wisest and best among us—requiring not merely the knowledge of the scientist, the skill of the engineer and the wealth of the capitalist, but also the broad view, the enlightened experience and the high endeavor of our greatest statesmen.

"In 1906-7 some experiments were made in England with the co-operation of Sir Oliver Lodge, the eminent English scientist, in the stimulation of plant growth by electricity. It has been frequently observed that plant growth is stimulated by electric light, and numerous experiments have been made having for their object the stimulation of the soil by the application of electric current. The experiments reported by Sir Oliver Lodge in a privately printed brochure on Electricity in Agriculture are briefly as follows:

" 'Two tracts of land about twenty acres each were similarly sown or planted. On half of this land poles with insulators were erected to support the electric wires, only one pole per acre being required for the purpose. The electricity required was produced by a small dynamo driven by a two-horse-power oil engine and was transformed to a tension of about 100,000 volts of very high frequency. The experiments, which extended over several years, gave remarkable results, an increase of from 30 to 40 per cent being secured in wheat crops grown on the electrified plot as compared with the crop produced on the unelectrified plot. Moreover, the electrified wheat was of a better milling and baking quality and sold at a considerably higher price than that grown on the unelectrified plot. Similar experiments with strawberries, mangolds, tomatoes, cucumbers, beets and carrots showed equally remarkable results. One-year strawberry plants showed in one instance 80 per cent increase and more runners produced, while with five-year plants the increase was 36 per cent.'

"In writing to me on this subject in response to my request, Sir Oliver Lodge suggested that the results attained in the experiments referred to and in others would justify an elaborate series of experiments. These experiments could be usefully undertaken at the stations under the control of the Agricultural Department.

"An explanation given for the excitation of vegetation by these high tension currents is that high-frequency electrical discharges favorably affect the deposit of the nitrogen in the atmosphere into the soil, upon which deposit vegetation so largely subsists.

"Whatever prevents disease and insures health contributes not only to man's happiness, but also to his efficiency, and it appears that the electric current is to play a very important part in this field.

"The outcome of the efforts of one who specializes in any particular kind of apparatus is often interesting. The development, by Doctor Peter Cooper Hewitt, of the mercury vapor lamp has provided a light which is the least fatiguing to the human eye of all artificial lights, and experimentation with this lamp has led to the development of several other uses of the mercury vapor arc, one of which is the production in quartz tubes of ultra-violet rays, the effects of which are likely to be of the very highest importance in our daily lives. While these ultra-violet rays are emitted in the quartz tubes, they are effectively neutralized by the glass tubes which contain the mercury vapor used in lighting.

"One of the important uses to which these ultra-violet rays have already been put has been to absolutely sterilize water, however much it may have been contaminated by bacteria. Experiments have also shown that the ultra-violet rays will sterilize milk without the application of heat in such a manner that it can be kept in properly sterilized vessels for long periods without deterioration or loss of its food values.

"With the growth of population, the pollution of rivers, and the contamination of the water supply upon which our population must rely, and the difficulty of determining whether the water and milk we use are free from noxious bacteria, this safe and thorough method of sterilization becomes of inestimable value. The elaborate experiments and demonstrations which have already been made at the Sorbonne, in Paris, and at the City Water Works of Marseilles, France, have not only proved the feasibility of this method of sterilization, but have brought out the fact that a 15,000-kilowatt generator of electrical energy could sterilize, by means of mercury vapor quartz lamps, as much water as is actually used for drinking and cooking in the United States.

"The simplicity of the apparatus for sterilizing water is such that there is no doubt but that it can be advantageously installed in factories and other places, and even in dwellings, adjacent to the point or points where the water is to be used, thus avoiding any possible contamination between the point of supply and the point of use.

"The electric energy required for the operation of a quartz mercury vapor lamp used for the daily sterilization of 85,000 gallons of water is about equal to that required for half a dozen ordinary incandescent lamps.

"Not only have water and milk been sterilized, but in other experiments, also carried on at the Sorbonne, it was found that new wine was affected in a manner to give it the qualities normally attained in years, or an age of apparently many years was given by a few seconds' application of the ultra-violet rays.

"These experiments and investigations suggest that uses for the ultra-violet rays will be found which have not yet been conceived.

"An important use of the mercury vapor apparatus has been to transform or rectify alternating currents into continuous currents, and some recent experiments indicate that this can be done on a large scale with a considerable saving of electrical energy. These promising results foreshadow the disappearance of the costly rotating apparatus which is now used for that purpose in the operation of railways and for purposes where the use of a continuous current is advantageous.

"The transmission of electrical energy through the atmosphere without wires has, in a very few years, so far advanced that wireless telegraphy is now an important feature of our daily life. We read of instances where wireless messages have been received at a distance of over three thousand miles from the point at which they were sent, and it is said that we shall shortly have regular wireless communication between Paris and New York.

"Not only has it been possible to communicate by wireless in the Morse code, but it has been found that, with suitable apparatus, telephone conversations can be carried on over considerable distances, and it is expected that by improvement in the apparatus, thoroughly practical results will before very long be obtained. Investigations, of which there is almost daily mention in the public press, indicate such great simplification in wireless telephone apparatus that we may, within the quite near future, have placed at our disposal a simple portable apparatus which will permit wireless conversation to be carried on over a considerable area. This will prove of great value in sparsely settled districts.

"It may interest you to know that the frequency of the electrical waves sent out by some forms of wireless transmitters approaches a million per second, and that by either an increase in the amplitude of these vibrations or by a more sensitive receiver, the distance over which these waves (which undoubtedly extend to an infinite distance) may be recorded, can be greatly increased.

"In an experiment made by Doctor Peter Cooper Hewitt with powerful wireless transmission apparatus, including a mercury vapor interrupter, it was found that the effect of the high-frequency discharge upon the iron in the building occupied, such as water and heater pipes, quickly produced incipient fires within the room where the apparatus was erected, thus demonstrating the wonderful power of this incomprehensible force and suggesting great possibilities in the transmission of electrical energy without wires.

"The transmission of electric energy without wires, which will be especially valuable for signaling purposes and for the control of machinery at a distance, will undoubtedly play a most important part in army and navy operations.

"The advantages of co-operation in the matter of the development and supply of electricity, having regard to a lessening of the cost and insuring the certainty of supply, cannot be overestimated, and those already secured by operations on a large scale are well known. Further co-operation in this great work for the benefit of the public, if not voluntary in the future, should, in my opinion, be an enforced one, notwithstanding the outcry which has been raised by the ill-informed with reference to an imaginary monopolization of the water-power of the nation. Encouragement should be given to the investment of capital in the development of these enterprises under such wise and reasonable regulation as will insure economy in the construction and operation of plants, adequate returns to the capital invested, and at the same time protect the consumer against exorbitant rates and charges or unfair discrimination.

"In the larger industrial developments which I foresee there are other important factors which equal in importance the development of the water-power resources upon which I have dwelt. I have particularly in mind those existing restrictions which make it difficult and expensive for a small corporation to carry on conveniently and in a simple manner its business with ramifications in several States, which restrictions, however, the great corporations of the country can easily surmount by reason of their financial ability to organize separate subsidiary companies in those States where such an expedient is rendered necessary to meet legislative requirements."

Pure Science and the Public Weal

THE proposition that practical results are the sole justification of the pursuit of pure science has a vast army of adherents, ready at every moment to uphold by word or deed their article of faith. If, therefore, this side of the question requires little further support, there is all the more reason why we should lend an attentive ear to the voice of those who, perhaps with broader mind and deeper insight, proclaim the supreme importance of pure science and its fuller justification. Let us then give heed to the able advocacy of Prof. Sedgwick Minot:*

"We are so accustomed to the practical advantages that have followed from abstruse science, that we connect them with their source only by a distinct mental effort. The wonders of practical science have been recited so often that their reiteration has become tedious, and we no longer feel strongly impelled to felicitate mankind on the parlor match, the telephone and the antitoxines, although we indulge at present in an unsubdued excited anticipation of wonders to come, especially in the domain of medicine. Are we not all on the watch for the announcement of the cure for cancer, and vaguely for other new and astounding reliefs from disease! Such concentration of interest upon novel practical results is not wholly favorable to science.

"It is true that a large amount of investigation is going on which aims to secure immediate practical results. In chemistry and medicine especially the activity in the work of applied science is very great.

(Continued on page 317.)

*Extract from the vice-presidential address delivered before the Section of Physiology and Experimental Medicine of the American Association for the Advancement of Science, at Minneapolis, December 29th, 1910.

[The Editor of the Home Laboratory will be glad to receive any suggestions for this department and will pay for them, promptly, if available.]

Photo-micrography for Amateurs

By Norman Barden

PHOTO-MICROGRAPHS are pictures of minute or microscopic objects that have been magnified.

A micro-photograph is a microscopic picture of an object that can be seen with the unassisted eye.

The two terms, photo-micrography and micro-photography, should not be confounded, as their meanings are very different. Photo-micrographs show objects and their details which are far beyond the reach of the unassisted eye; while micro photographs are oddities of the art of photography and are made to be viewed through the microscope.

There are two ways in which photo-micrographs may be made, namely, by using a single lens with a short focal length or by photographing the object through the whole microscope, i. e., photographing the image enlarged by the eyepiece. In the first case the eyepiece is not used at all, but in the second case the eyepiece is left in its position. It is this last similar position. This is accomplished by using two retort stands as supports for the camera. To fix the camera at the right height, remove the lens and open the shutter. Put a few grains of sand upon a glass slide, place upon the stage and then focus the microscope upon them. Then hold the camera in such a position that the eyepiece of the microscope and the camera shutter nearly touch each other. Now adjust the retort stands so that they will support the camera in this position. Insert the ground glass in the camera and very slowly draw out the tube of the microscope. Soon a sharp image of the stand will appear upon the glass. Then the retort stands may be readjusted to hold the camera so that the camera shutter is about an eighth of an inch from the eyepiece of the microscope. This distance ought to allow room enough for the various adjustments that are required for the focusing of different objects. The diaphragm of the camera may be adjusted to exclude any light which might enter around the eyepiece. If possible have the eyepiece slip into the socket used for the lens, as this insures a light-tight fit. The drawing gives a clear idea of the arrangement of the microscope and camera. After the apparatus has been arranged, it will be necessary to put the room in a proper condition.

The room must not be too light. If sunlight is used, it is best to have all openings darkened except the one through which you receive your light. If artificial light is used, have all other sources of light cut off. The same room in which the photographing is done can generally be made to serve as the dark room. Do this, if possible, as it will save a great deal of walking as well as time. Having put the apparatus in a fixed position and the room in a proper condition, the photo-micrographer is ready for making photo-micrographs.

Focusing an object which is being photographed through the eyepiece requires a very fine movement of the microscope tube. Place the object on the stage, get a rough focus upon it. Now place the object in the center of the field. Then get a fine focus upon it and regulate the intensity of the light by means of the diaphragm beneath the stage. Try to secure an illumination which best brings out the details wanted. If reflections from the inner surface of the tube of the microscope are found, put in a cylinder of dead black paper. Care must be taken to have every lens clean and dry. When the object has been placed in the center of the field, the light regulated, and a good focus has been obtained, everything is ready for the exposure.

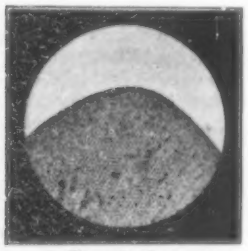
There are no rules that can be laid down in regard to the length of exposure. The amateur must learn to judge this by the brightness of the image. The length of exposure also depends upon the kind of light used—sunlight or artificial; the power and angle of the objective and the distance of the plate from the eyepiece of the microscope. A good thing for an amateur to do is to keep the distance between the plate and the eyepiece constant throughout all of his exposures, until he knows the correct time for exposing that distance. Use one kind of light and do not try first sunlight and then artificial. Keep a complete record of every plate. It will greatly help in finding the correct time for photographing other objects.

After the plate is exposed, develop it in any good developer and develop until the outlines of the image are clearly seen from the back of the plate. This is essential in obtaining good dense negatives. Fix the plate thoroughly in a strong hypo solution and then wash with plenty of water. A coat of varnish on a good plate will greatly insure its keeping qualities. If the foregoing instructions be carefully followed, there should be no reason for anybody's failing to make good photo-micrographs by using the eyepiece to enlarge the image.

Perhaps the easiest specimen to obtain is a common house fly. This fly contains several good objects, such as the eyes, the tongue, the wings and the legs. Wings may be mounted dry between two pieces of glass. To prepare a fly's leg it must be soaked for a few days in a solution of caustic potash or soda and then mounted in Canada balsam.

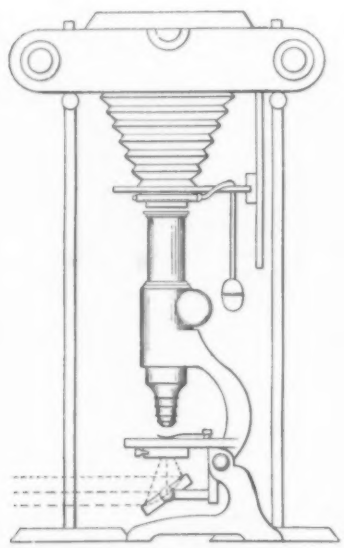
One of the accompanying photographs shows a few blood corpuscles. These are best mounted by placing a drop of blood on a slide and then spreading it out over a large area by dragging another slide over it. Do not press or else the delicate corpuscles will be crushed. After the blood is dry a good field may be picked out and photographed.

Sections of stems of plants often yield very pretty negatives. The section of the marigold stem, shown herewith, was cut by hand with an ordinary razor blade. The cutting was carried on under water, as very thin slices can be cut in this manner. It is best to mount the sections in water so that the cells will be transparent. Sections of wood may also be made in the same manner. All sections, however, must be cut very thin so that the light can be transmitted through them, unless reflected light is to be used. In conclusion, it may be said that there is an unlimited supply of objects for the photo-micrographer, many of which are beautiful as well as exceedingly interesting.

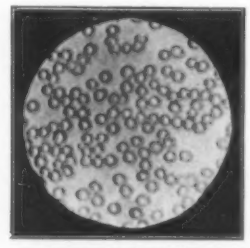


Tip of a fly's wing.

The leg of a fly.



Apparatus for making photo-micrographs.



Corpuscles in a drop of blood.

Section of a marigold stem.

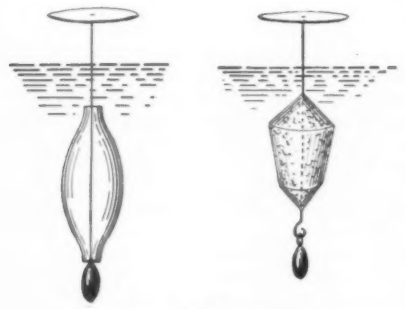
PHOTO-MICROGRAPHY FOR AMATEURS

Simple Hydro-comparators

By Frederick William Salmon

I WAS very pleased to see upon page 524 of the SCIENTIFIC AMERICAN for December 31st, 1910, a description of a very simple hydro-comparator of weights.

I have on various occasions used a very similar device, except that I have made mine in other ways that I believe have advantages over the style that you describe.



Two simple hydro-comparators.

I have made some out of very light glass tubing, heating it and blowing in it and so producing a kind of a bottle, shaped about like a fishing float, passing a fine wire through it, and sealing this wire in it with paraffine, and to the lower end of the wire securing a small fishing sinker, and to the upper end a small circle of thin celluloid. I have also made them of cork, very much like the one you described, except that I have always been very careful to make the upper and lower ends of the cork conical, and fit a fishing sinker to the bottom end of the wire, and then paraffine the whole instrument up to the celluloid pan at the top, and afterward scrape the paraffine off the upper wire for very accurate comparisons. Another good way to make one is to use a hook on the lower end of the wire passing through the float, then sinkers of various weights may be used with one float, and thus a much larger variety of work done with one instrument.

From practical experience I know that in many cases small air bubbles will cling to parts of a hydro-comparator made like the one described in your late issue, and these will lead to erroneous work, or cause other troubles and delays, while one made as I describe is very little subject to such trouble. I always paraffine them, and much prefer distilled water to any other medium.

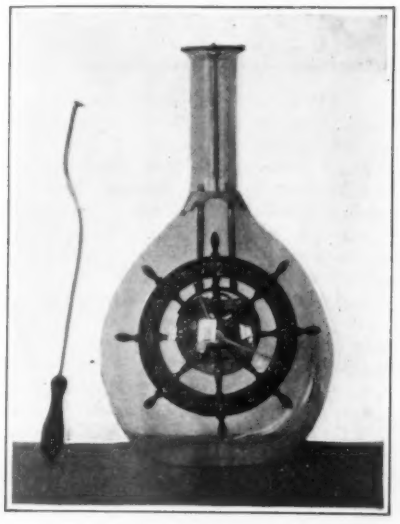
Importation of Moth Parasites

THE Bureau of Entomology has been largely aided in its campaign against the moth family by the importation from abroad of moth parasites. The results from their importation have not been entirely satisfactory, yet they are sufficiently so to justify further work along these lines.

Curiosities of Science and Invention

Clock in a Bottle

SOME time ago, we published a photograph of a clock with the works in a bottle. This was of foreign make. Herewith we illustrate a similar device made by George W. Wharmby, a native of this city. The dial of the clock consists of a ship's wheel 5 inches in diameter, while the clock movement is contained in a barrel 2¼ inches in diameter. Yet the neck of the flask containing the clock is less than an inch in diameter. To assemble the clock, it was divided into sections small enough to be introduced through the narrow neck. A wooden platform was erected in the flask, and on this the ship's wheel was put together in horizontal position, the parts being connected with screws, after which it was raised to the vertical position, and the spoke handles were fitted in and glued in place. The cylinder or barrel for the movements was introduced into the flask in the form of a flat strip, and then bent around and fastened together with screws. The back of the cylinder was also bent to conform to the shape of the neck, and then straightened out after being introduced into the flask. The works are suspended from a cross piece fitted into the neck of the flask. A ratchet system is employed for winding the clock and setting the hands, and this may be reached by the rod shown at the side of the bottle.



CLOCK ASSEMBLED IN A FLASK

Novel Log Skidding and Loading Machines

IT is undoubtedly true that the most racking strain to which a hoisting engine can be put is in skidding or "snaking" along through the timber. The engine must necessarily work at high speed to accomplish satisfactory results, and the nature of the work subjects it to frequent and extremely severe shocks. An interesting machine of this type is shown below. This machine is equipped with two hoisting engines of two drums each, especially designed for the purpose, one of which is used for skidding logs to the track for a distance up to 1,000 feet and the other located near the foot of the boom having one drum for carrying the hoisting or loading line, and another or front drum for hauling or "spotting" the cars up the inclined track and through the machine. The machine is provided with a frame which is carried on two-wheeled trucks which are connected to the skidding engine above mentioned by means of heavy steel sprockets and chains, thus making it self-

(Continued on page 317.)

An impromptu antenna.

Manhole as a ground.

THE ELECTRO-MAGNETIC EAR

Their Private Car

A YOUTHFUL genius of Los Angeles, California, has constructed the railroad motor car shown in this photograph, for the exclusive use of himself and his friends, and almost any Saturday afternoon it may be seen whizzing up and down the stretch of track near his home. This ingeniously contrived car is constructed of four iron wheels, a few lengths of 2 × 4, and the engine from a disused motorcycle. The gasoline tank formerly contained maple syrup, and the tool case is neatly adapted from a soap box and contains a tack hammer, a bicycle wrench and a beer bottle full of lubricating oil.

The transmission on this home-made car consists of an old leather belt, presumably adapted from an outworn harness, which connects the engine in the center of the car with the rear axle.

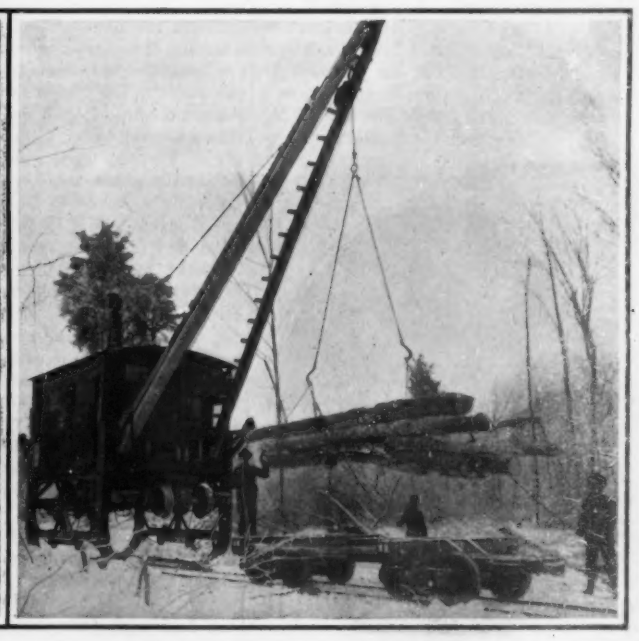
In spite of its apparent crudity this little motor car has the one prime requisite of success—it works.

MOTOR CAR BUILT BY A BOY IN LOS ANGELES, CAL.

The Electro-magnetic Ear

"WHEN a person wants to telegraph to a friend, he knows not where, he will call in electro-magnetic voice which will be heard loud by him who has the electro-magnetic ear but will be silent to everyone else," said Prof. Ayrton fourteen years ago. His prophecy is coming true. Wireless apparatus, particularly the receiving apparatus, is so simple that one can readily carry it about his person. A man in Philadelphia uses a portable receiving apparatus, comprising a pair of telephone receivers, a detector and tuning coil. It is quite apparent from the expression of the man that he is sorry that he cannot talk back.

The cars pass up an inclined track through the loading machine.



Machine with trucks raised to leave a clear track.

REMARKABLE SELF-PROPELLING LOG SKIDDING AND LOADING MACHINES

The Inventor's Department

Simple Patent Law; Patent Office News;
Inventions New and Interesting

The International Protection of Industrial Property

THE interests of the United States of America will be in good hands at the Congress of the International Union for the Protection of Industrial Property, that convenes in Washington on May 15th, next. In the selection of delegates to represent the manufacturers and inventors of this country at this very important assemblage, President Taft naturally wanted men who had accomplished something in the field of their chosen profession. The men who are to sit in the May Congress will be empowered by their respective governments to sign treaties, and amendments to treaties, relating to the protection of industrial property; and while all such treaties are, of course, signed subject to ratification by the adhering nations, it is essential that the delegates who sign them thus tentatively must know the situation thoroughly and have at their finger-tips the needs and necessities of their own constituencies. They must have a knowledge of what has been done; opinions as to what should be done, and the firmness to protect their own nations on every point.

The periodical conferences of the union have taken place heretofore at Paris in 1880 and 1883; at Rome, 1886; at Madrid, 1890 and 1891, and at Brussels, 1897 and 1900. In the preparation for these conferences the Bureau Internationale at Berne, with the approval of the administration of the country where the reunion is to take place, prepares propositions to be submitted to the latter, with statements of reasons or arguments. When the administration has finally approved such propositions, the Bureau Internationale sends them to the governments of the other nations adherent to the union, asking them to prepare propositions and counter-propositions. These are all printed and distributed among the adhering nations prior to the date of the assembling of the conference.

The number of delegates each government may appoint to represent it at the conference is optional. The United States being the host, Mr. Taft selected five men prominent in the world of patents. The appointments of the Commissioner of Patents, Hon. Edward B. Moore, Mr. Frederick P. Fish, Mr. Charles H. Duell, Mr. Melville Church, and Mr. Robert H. Parkinson, were announced last year. A portrait of Commissioner Moore was published in these columns only two weeks ago, for which reason it seems unnecessary to add his picture to the portraits here published.

C. H. DUELL

On account of his position at the head of the United States Patent Office and because of his wide knowledge of patent matters, both domestic and international, through nearly a third of a century's association with the Patent Office and a wide experience in the negotiating of foreign treaties, Mr. Moore was selected as chairman of the American delegation. In this capacity he will make the opening address

MELVILLE CHURCH

when the Congress assembles. Upon him, aided by his committee, devolves the duty of selecting the place of meeting in Washington, and the entertainment of the delegates of foreign nations and those who accompany them.

Mr. Moore is a son of New England, having been born at North Anson, Maine, December 25th, 1851. He claims Michigan as his residence, however, as his parents settled in the Wolverine State when he was still in his boyhood. Commissioner Moore was a page in the United States Senate at the beginning of his career in Washington, and was educated in the law at the National University Law School, entering the Patent Office as an assistant examiner in 1883. He was successively law clerk, principal examiner, and assistant commissioner, and his appointment to the post of Commissioner of Patents on June 1, 1907, was the first time that a Commissioner of Patents had been appointed from within the ranks of the Patent Office. Mr. Moore was special commissioner to the Paris Exposition of 1900, and delegate to the International Conference for the Protection of Industrial Property at Stockholm, in 1908. The State Department dispatched him to the nine principal capitals of Europe in the fall of 1909 to negotiate reciprocal patent protection, and in the summer of 1910 he was again obliged to pack his trunk for foreign parts, this time being commissioned as "expert attaché" to the American delegation to the Fourth International Conference of American States at Buenos Aires, Argentina, where he was instrumental in securing the adoption of the three conventions which he had himself prepared, relating to patents, trade marks and copyrights. The text of these conventions has been already printed in the SCIENTIFIC AMERICAN.

In spite of his "globe-trotting" propensities on behalf of international patent matters, Mr. Moore has been holding a firm rein on the Patent Office. His administration has been productive of many badly-needed reforms. He never gives up fighting for what he thinks is right and needful and has the reputation at the Capitol of getting pretty much what he wants. He realizes that the Patent Office being self-supporting and enjoying a huge surplus as the result of the payment of fees by inventors and manufacturers, is entitled to the best facilities for doing its work. Just now his energies are bent on the success of the Congress of the In-

FREDERICK P. FISH

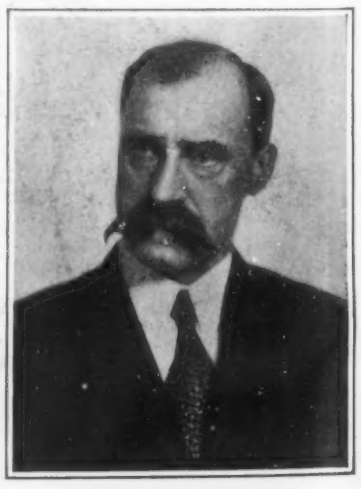
ternational Union in May, but he has not lost sight of the fact that the Patent Office needs more room, and he intends, as soon as the International Conference is over, to put his shoulder to the wheel and induce the Sixty-second Congress to let him spend some of the Patent Office surplus for a new building.

Hon. Charles H. Duell was Commissioner of Patents from 1898 to 1901. His administration was the last, but one, prior to Mr. Moore's appointment. Though he is practising patent law in New York, he is still a familiar figure at the Patent Office, where he often drops in for a business or social chat with his former associates. Mr. Duell was born at Cortland, N. Y., April 13th, 1850, and studied law at Hamilton College in 1872, receiving the degree of Doctor of Laws from his alma mater in 1906. His public career began as a member of the New York Assembly, 1878 to 1880; as a patent lawyer he afterward practised in Syracuse. After his term as Commissioner of Patents expired in 1901 he became assistant treasurer of the Republican National Committee, and in 1904 was appointed associate justice of the Court of Appeals of the District of Columbia, to which tribunal all the appeals from the decision of the Commissioner of Patents are taken. In 1908 he was presidential elector-at-large from New York, and served as president of the New York electoral college in 1909. In 1910 he was treasurer of the National Republican Congressional Committee. Mr. Duell married, in 1879, Miss Harriet M. Sackett, and resides in New York, where he is the senior member of Duell, Warfield & Duell, composed of F. P. Warfield, formerly an examiner in the Patent Office; Mr. Duell's son, Holland S. Duell, and Robert S. Blair, former examiner in the Patent Office. He is a member of the Cosmos Club, Washington, and the Union League, the Lawyers' and the Republican clubs of New York. He is widely known as a writer on patent subjects, and contributed an article on patents to the American Cyclopædia of Law.

Frederick P. Fish, Esq., was born at Taunton, Mass., January 13th, 1855, and received his education at Harvard, taking his degree as Master of Laws in 1875. Mr. Fish is very modest in speaking of his achievements, but he has steadily forged to the front rank of our practitioners of patent law, and is a recognized authority upon the subject. He gave up his practice in 1901 to become president of the American Bell Telephone Company and later the American Telephone and Telegraph Company, which companies he served with distinction for six years, resuming in 1907 his practice in Boston. Mr. Fish is a director in the New England Trust Company, the Old Colony Trust Company, the City Trust Company, all of Boston; is a member of the board of overseers of Harvard, and chairman of the Massachusetts State Board of Education. He married, in 1876, Clara P. Livermore, of Cambridge, Mass., and makes his residence in Brookline. He is a member of the Union, St. Botolph, University and Exchange clubs of Boston, and the Union, University, Grolier and National Art clubs of New York city.

Melville Church, Esq., of Washington, was born at Utica, Oneida County, New York, December 16th, 1856. His study of law was pursued in the office of Lysander Hill, of Washington, and he also attended the Columbian University, now the George Washington University, receiving the degrees of Bachelor of Laws, Master of Laws and Master of Patent Law, and was admitted to the bar of the Supreme Court of the District of Columbia in 1879 and to the bar of the Supreme Court of the United States in 1882. Mr. Church is the professor of patent law at George Washington, a position he has occupied for the past sixteen years. He is much beloved by the students and a large number of the younger patent lawyers of Washington, who boast of the honor of attending the Church lectures on patent law. Mr. Church is married and has a large family. His son, Melville Church, Jr., is now associated with him in practice. Mr. Church is a member of the American Bar Association and is president of the Patent Law Association of Washington. He is a member of the Cosmos and Chevy Chase clubs, Washington.

Robert H. Parkinson, like Commissioner Moore, was born in Maine, and graduated at Dartmouth, before he was



ROBERT H. PARKINSON

twenty-one. His legal studies were pursued in the office of Converse & French, Woodstock, Vt., and the office of Cross & Burnham, Manchester, N. H. He went to St. Louis, where he passed the bar examination and was admitted. He practised general law in St. Louis and was for a short term assistant attorney for the Atlantic Pacific Railroad Company, with headquarters at St. Louis. He was later employed in the law office of Fisher & Duncan, of Cincinnati and New York, and upon the death of Col. S. S. Fisher, the head of the firm, Mr. Parkinson became the junior member of Hatch & Parkinson at Cincinnati, helping to edit the sixth volume of Fisher's patent cases. In 1893 Mr. Parkinson removed to Chicago, leaving his brother in possession of the Cincinnati offices. He is at present the senior member of Parkinson & Lane.

Most of Mr. Parkinson's professional life has been occupied in patent litigation, with respect also to trade mark and copyright causes. He has argued many cases in the Supreme Court of the United States and has appeared in cases in all of the federal circuits. He is a member of the American Bar Association, the Illinois Bar Association, and the Cincinnati Bar Association. He is a member also of the Chicago, the Union League and the University clubs of Chicago, and the Lawyers' Club of New York. Mr. Parkinson has never been a candidate for public office.

No one need fear that the best interests of the manufacturers and inventors of the country will not be upheld by the five gentlemen whose personalities and careers have been above set forth. They are representatives of the highest circles in the realm of patents; they are sound in their views on the rights of applicants and patentees, and the distinguished honor which President Taft has conferred upon them has been richly deserved, as the history of their achievements will eloquently testify.

An interesting feature of these brief histories is the testimonial to the tradition of "Yankee ingenuity." All five of these men are Yankees by birth, although they are at present well scattered over the face of the country. It thus appears to be something more than a jest to state that ingenuity—speaking from the standpoint of knowledge of invention—is a Yankee characteristic.

Notes for Inventors

The Raconteur of the Patent Office.—Hon. Cornelius C. Billings, the First Assistant Commissioner of Patents, enjoys quite a reputation among his associates as a humorist. As a relief from the ordeal of presiding at hearings, and the writing of judicial opinions in patent cases, Mr. Billings writes jokes, and the magazines are always glad to accept them. Mr. Billings is familiarly known by his intimates as "Josh," which is a delicate compliment to his humoristic achievements. But, as distinguished from his famous name-sake, Mr. Billings writes all his stories in the purest English. He is a graduate of the Naval Academy and had command of a ship during the Spanish-American war. Out-of-town patent attorneys who drop in at the Patent Office are usually to be found in the room of the First Assistant Commissioner at some time or other during the day, where they are entertained by the newest Billings anecdote.

Protests Against Patent Applications.—Numerous so-called protests against the allowance of patents to applicants therefor are forwarded to the Patent Office and to attorneys. The practice in this respect is definite and it will be interesting to inventors generally to know that a rule of the Patent Office provides that no attention will be paid to unverified *ex parte* statements or protests of persons concerning pending applications to which they are not parties, unless information of the pendency of such applications shall have been voluntarily communicated by the applicants. It will be noticed that the statement or protest must be verified, that is, it must be sworn to, and the information of the pendency of the application must have been voluntarily communicated by the applicants. This should clearly appear in any protest as the Patent Office rule makes it a necessary part of the statement or protest.

The Universality of Invention.—An experience extending over many years impresses the writer with the fact that invention is common to all classes and that it is accompanied invariably with great enthusiasm. Only a few days ago in a street car the writer sat opposite a man evidently in humble circumstances, who held in his hand the model of some contrivance and he looked at it with the eye of a lover. And so it is with them all. Whether millionaire copper king, patent medicine man rolling in wealth, negro porter, or a negro client the writer once had from the South, who looked like a descendant of one of the African kings and had a very ingenious improvement in compound engines, they are all characterized by an enthusiasm that endures. And this is one of the great charms of the pursuit, the creative character of invention operating to maintain the interest and absorb the attention of the inventor. Financial failure does not detract from the pleasure of invention, for the inventor often states that the pleasure he had experienced in producing an invention well repaid him for the effort, even though on completion it was found to have been anticipated by another.

Wanted: A Method of Destruction.—Some features of modern construction add new problems to the problem of building. This is particularly true of concrete construction and fireproofing. Ordinarily the life of a building, a business building for instance, is from twenty-five to thirty-five years. Buildings as constructed a score of years ago can be wrecked at little or no expense, sometimes, in fact frequently, yielding a small profit from the reclaimed material over the cost of tearing down and hauling away. The other day it became necessary in the march of improvements in New York city to tear down a reinforced concrete building, and the actual cost of wrecking it was $22,500. Thus it will be seen an important factor enters into the consideration of this form of construction. In addition to the cost of construction, you must also figure the cost of demolition. It seems worthy of the thought and study of architects, if not of inventors, for it may require invention of a high order, to devise some satisfactory building scheme in the way of reinforced concrete which will not detract from the structure and will permit the wrecking of the building, when necessary, at a reduced cost, if not at a profit as with former constructing.

Dr. Bell on Sheep.—Some time ago a well-known Washington patent attorney was making a trip to New York in company with a client, a prosperous Westerner. Client and lawyer went into the smoking compartment and the patent attorney soon engaged in conversation with a friend who, after a while, proceeded to tell of some interesting experiments he had been conducting for some years with a view to developing the rudimentary teats of ewes. He spoke at length and with much interest on the subject. When he left the smoker, the Westerner eagerly asked the attorney who the man was, and was told he was Dr. Alexander Graham Bell, the inventor of the telephone. "Well!" he said, "I have been raising sheep all my life, own thousands of them now on the hills of ———, and that man has told me more about sheep than I ever dreamed of."

Dr. Graham Bell has pursued his development of the rudimentary teats along with his experiments in connection with an effort to cause sheep to uniformly breed twins, triplets, and litters, in which endeavor he has had, we are told, considerable success.

RECENTLY PATENTED INVENTIONS.

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

The weekly *Index of Patents* issued by the *United States Patent Office* will be found in the *Scientific American Supplement*.

Pertaining to Apparel.

OVERALLS.—A. ELOESSER, San Francisco, Cal. These overalls are designed for the use of carpenters and other mechanics and are provided with a nail pouch capable of swinging freely and to hang vertically with a view to prevent the nails from falling out of the pouch when the wearer is nailing and in stooping positions, means being provided to hold the pouch close to the body and against swinging, to prevent free use of the hands when sawing or in similar operations.

Electrical Devices.

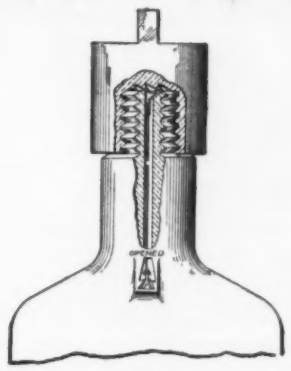
CLOCK OPERATED ELECTRIC SWITCH.—J. W. HANSEN, Princeton, N. J. This invention provides a mechanism adapted to be actuated by a time mechanism; provides for connecting the alarm mechanism of an alarm clock with the switch mechanism of an electric switch, whereby the switch is operated by the alarm mechanism as and when the same is operated to inaugurate or discontinue an electric illumination; and provides a carrying frame and locking attachment to receive in separable relation clocks of varied standard construction.

Of Interest to Farmers.

TRANSPLANTER.—A. G. JACOBS, Jonestown, Miss. In this case the invention has for its object the provision of a simple and inexpensive device by means of which the plant, together with a sufficient amount of the soil to insure the life of the plant, may be transplanted from one point to another.

Of General Interest.

BOTTLE.—THOMAS M. DANIELS, 557-561 Jackson Boulevard, Chicago, Ill. The purpose of the invention shown in the engraving is to provide a bottle with a cap employed in conjunction with the cork, and a device that will remain as a constant pointer, indicating that the bottle has been opened, which device is automatically operated upon the removal of the cap and withdrawal of the cork. The equipment described will in no way interfere



BOTTLE.

with the filling of the bottle. The ordinary cork is employed in connection with a protective stopper and it is impossible to draw the cork without removing the stopper, or to draw the cork without making it apparent that the bottle has been opened, no matter how skillfully the cork may be replaced or the stopper fitted to the bottle, thus preventing a sealed bottle being presented a second time as an original package without detection.

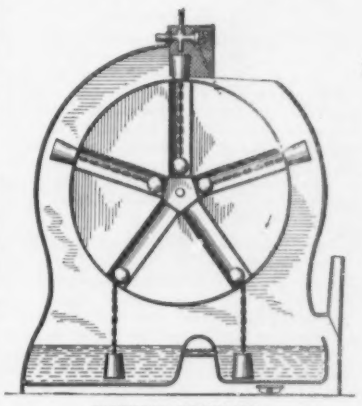
CONTOUR INTERPOLATOR.—J. R. VAN DUYNE, White Plains, N. Y. This improvement refers to drafting instruments, and provides a device, more especially designed to interpolate between the two elevations plotted in plan points on any required intervening contours. For this purpose, use is made of a base plate having a straight edge, an arm intersecting it, and a carrier capable of moving on the plate and on which the arm is mounted.

FEED BASKET.—D. P. SAMMON, New York, N. Y. The aim here is to provide a basket made of wire cloth, reinforced, to maintain its shape at all times, and to provide ventilation for the animal to breathe freely while feeding, to permit dirt and other fine extraneous matter to sift out through the meshes of the wire cloth, and prevent spilling of the feed in case the animal tosses its head in upward or backward direction.

POLE.—F. M. WILCOX, Lyme, Conn. This inventor provides a pole consisting of an elongated body, preferably hollow and constructed of iron, with means on the pole for climbing the same and a flattened head formed on the pole for receiving the supports adapted to carry electric wires, clothes lines, and other current conducting or supporting device.

CISTERN OR TANK.—A. B. CRAWFORD, Hastings, Neb. The object here is to produce a tank of plastic material for holding water under pressure, which will be of sufficient strength to resist the pressure, which may be easily cleaned and which will not leak, and will keep the water sweet and pure, and at practically the same temperature regardless of the weather.

DRINKING FOUNTAIN.—PERY A. TORNWALL and RICHARD M. BOYD, Houston, Miss. As at present constructed and arranged the public fountains are a source of danger due to their propagation of many forms of disease where inoculation is incident to membranous contact. The invention shown in the illustra-



DRINKING FOUNTAIN.

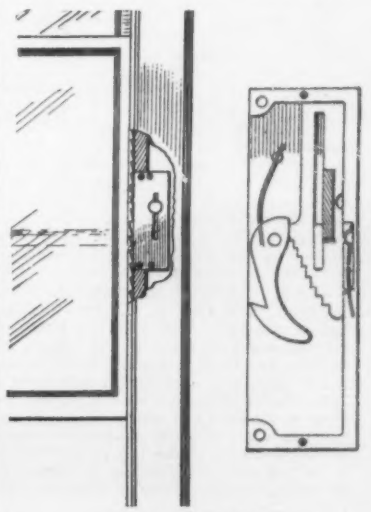
tion has in view to provide a fountain wherein the drinking cups are treated antiseptically during intervals between periods of use; and to provide a fountain with means for removing grease or other foreign substances from a drinking cup between the periods of use. An antiseptic solution is used, selected as best suited to the removal of bacilli which might adhere to the cup.

Hardware and Tools.

SAFETY RAZOR.—E. KESSLER, New York, N. Y. This invention pertains to safety razors, and more particularly to a device comprising a blade carrier adapted to have a removable blade mounted thereon, a blade holder movably associated with the carrier and serving to secure the blade in place, and a guard for the blade, the guard assisting in securing the blade holder.

HOSE REPAIRER.—T. H. WIEDER, Warren, Ohio. The invention is an improvement in devices for use in repairing hose, and for securing the ordinary fittings to hose by means of wire, and the invention has for an object to provide a construction by which the wire may be looped and secured tightly around the hose over the fitting or connecting devices, to securely fasten the hose in place.

WINDOW LATCH.—GEORGE ERZ, Lynden, Wash. The engraving represents a device for retaining window sashes in predetermined positions. An object of the inventor is to provide a device for use in positively locking either the upper or the lower sash in any position it may be put. A further object is to provide a latch which when shifted will permit the raising of either sash and will not permit a downward movement, so that the sash may be raised into one position and immediately raised to another without resetting the latch. The latch may be shifted to a third



WINDOW LATCH.

position, so as to permit the sash to have free movement up or down. The sash latch will work with shrunk windows or with window sashes which are loose.

Heating and Lighting.

LIQUID FUEL BURNER.—J. J. VALLIER, Oakland, Cal. This invention refers to the provision of a burner for use in connection with stoves, heaters, and the like, in which the liquid fuel is vaporized by means of a steam

jet, and which is provided with means for spreading the escaping fuel and steam, thereby to form an effective flame.

LIGHT FIXTURE.—M. F. FINKELSTEIN, New York, N. Y. The object of this invention is to provide a fixture for use with fragile incandescent electric and other lights, which is compact in form and attractive in appearance, which lends itself readily to ornamentation, and which provides a resilient support for the light, and acts as a shock absorber to protect the light from injury due to jarring or vibration.

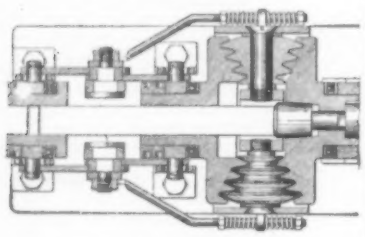
Household Utilities.

PORTABLE HEATING APPARATUS.—H. C. STOUT, Mt. Sidney, Va. In this patent the invention is a small, easily portable, and inexpensive apparatus adapted for convenient attachment to a shelf, table leaf, or ledge, or to a vertical wall, for use in supporting receptacles for liquids or solids requiring to be heated. The apparatus forms an easily adjustable support for receptacles for ordinary domestic use or for the sick chamber.

Machines and Mechanical Devices.

APPARATUS FOR MEASURING THE STEAM PASSING THROUGH A PIPE.—H. RUTHENBERG, 52 Königs Allee, Villenkolonie Grunewald, near Berlin, Germany. The object of this inventor is to provide means to rotate a paddle wheel and to hold this wheel, a cone adapted to be rotated by said paddle wheel and an apparatus for adjusting the cone in accordance with the pressure of the steam. Further, to provide a preliminary chamber arranged in front of the paddle wheel, and means to uniformly distribute the steam passing from the chamber to the wheel.

FRICTION GEARING.—LOUIS N. LACOMBE, 337 56th Street, Brooklyn, N. Y. The invention is shown in the engraving and relates to certain improvements in friction gearing for positively connecting driving and driven shafts, and more particularly to that type in which the driven shaft shall be rotated in either



FRICTION GEARING.

direction in respect to the direction of rotation of the driving shaft. Pinions are employed rotatable about radial axes for rotating the driven shaft in reverse direction to the driving shaft. One of the main objects is to simplify the control of these pinions, so that they will be entirely out of operation and may remain stationary when the shaft sections are disconnected when the direct drive is in use.

SUGAR REMOVER FOR CENTRIFUGAL MACHINES.—R. P. JOHNSON, New York, N. Y. This invention relates to a device for removing sugar deposited by centrifugal force on the walls of sugar separators. The object is to provide a device which can be used intermediate the separating operations, with a saving of at least 25 per cent in time and labor, and with the least detriment to the separator itself. The remover can be adjusted from an inoperative position without the bowl to an operative one within the bowl, and which can be further adjusted vertically, so as to remove the sugar from all parts of the bowl.

CABLE WRAPPING MACHINE.—H. D. ROBINSON, New York, N. Y. This invention has reference to the manufacture of cables, particularly those cables used for supporting suspension bridges, and in which there are a large number of separate strands held together and protected by one or more wires or strands wrapped around the main strands, to form an outer covering or casing.

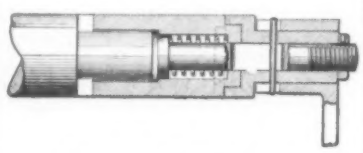
PAPER FEEDING MECHANISM.—F. E. ROBINSON, New York, N. Y. This invention London, England. This invention relates to mechanism for printing, folding, or the like machine, and more particularly to the type of feeding mechanism comprising a spring arm or arms secured at one end on a shaft and provided at the other end with a friction pad, so that when the shaft is rotated the pad is brought down on to the pile of paper sheets to be fed with more or less force and the sheets are fed forward one at a time.

Prime Movers and Their Accessories.

ROTARY ENGINE.—D. N. GREEN, Sunbury, Ohio. In carrying out the present invention the inventor contemplates means for preventing the sudden descent of the abutment valve after the shoe has passed it. This means consists in a curved member secured to the power wheel, whose outer surface acts as a slide for bringing about the abutment valve into position gradually, thereby preventing jars. Mr. Green has invented another improvement in rotary engines, the object of which is to provide a device with means for delivering the propelling fluid, which may be steam, compressed air, water, or any suitable medium; and to provide means for raising and lowering the abutment valve in order that the rotating power wheel with its shoe may pass underneath it.

SELF-OILING ARBOR FOR SHELL ROLLERS.—Y. L. YON, Edgefield, S. C. The main purpose of this improvement in textile machinery, is to provide a shell roller arbor, which shall be self-oiling, thereby doing away with the necessity of constantly oiling these rollers which run at a high rate of speed, and are, consequently, in frequent need of lubrication.

SAFETY CRANKING DEVICE.—GEORGE M. FISHER, 189 North Park Street, East Orange, N. J., and ALBERT E. EMBLETON, 264 William Street, Pittston, Pa. A safety cranking device is shown in the accompanying illustration. The invention has reference to starting devices, and has for an object to provide a



SAFETY CRANKING DEVICE.

safety cranking device for operating the piston of an engine preparatory to starting the engine. For the purpose mentioned use is made of a sleeve for engagement with a crank shaft of an engine preparatory to starting the engine, loosely fit the first sleeve, cams on the sleeves and adapted to engage, and spring controlled means removably and adjustably securing the said sleeves.

THROTTLE VALVE.—W. J. LILLY, Butte, Mont. This invention provides a valve adapted for use in high or low pressure, wherein the seating pressure is balanced; provides a construction wherein the wear of the operative member is minimized, provides efficient means for preventing the leakage of steam past the cut-off members; provides means for retracting the operating parts of the valve structure; and provides a compact, direct-acting and self-housed valve structure.

Railways and Their Accessories.

LOG AND LUMBER CAR.—C. H. RUGGLES, Hope, Ark. The object here is to provide a car especially adapted for use in logging and lumber railways, and consisting of a rigid frame, on which the load is carried, supported by a flexible frame. The car is adapted for short curves, and crude construction of logging railways.

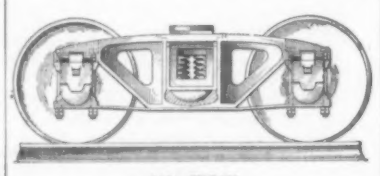
RAIL FASTENING DEVICE.—J. V. BERGEN, El Paso, Texas. Mr. Bergen provides rail fastening and means for clamping rails to steel, concrete or composition railway ties without the use of bolts, screws, spikes or similar devices entering into the body of such ties and preventing the force of impact blows upon the rails being concentrated at the point of rail contact.

RAIL JOINT.—JAMES W. BEARD, Merrill, Miss. This invention dispenses with the ordinary fish plate construction commonly employed in uniting the meeting ends of rails. The improvement illustrated herewith provides a novel construction of interlocking means at the meeting ends of the rails and on opposite sides of and lateral to the tread of the rail

RAIL JOINT.

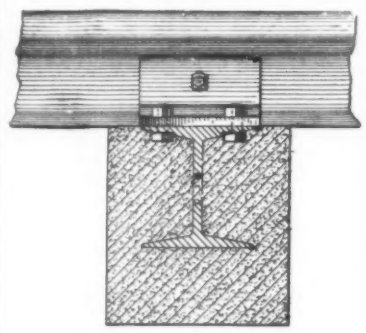
and including in the specific construction presented rearwardly facing hooks located one longitudinally beyond the extremity of the rail and the other in rear of the rail and depressed below the upper surface of the tread of the rail to avoid interference with the wheel flange and whereby the rails when united will be interlocked at points beyond abutting ends of rails in both directions beyond said joint.

CAR TRUCK.—JEREMIAH J. SULLIVAN, office of master mechanic, Louisville and Nashville Railroad Company, New Decatur, Ala. Among the principal objects which the present invention shown herewith has in view are: To provide a construction for car trucks which is flexible, being adapted to equalize the carrying strain and to relieve the flange pressure on the truck wheels; to provide a spring plank constructed and arranged to hold the side frames and bolster in alinement; to provide a rocking connection for the spring plank with the side frames, said connection being arranged to yield to sudden strains and to resume position under normal conditions; and to provide a construction wherein is eliminated bolted connections or fastening devices.



CAR TRUCK.

RAILROAD TIE AND RAIL FASTENER.—JOHN J. PLANETT, Box 494, Amarillo, Texas. Mr. Planett's invention shown in the engraving is an improvement in reinforcing concrete railroad ties, and has in view a relatively strong reinforced concrete tie to which the rails are readily and securely applied, and having a form to operate in connection with the adjacent ties to retain the ballast. The tie gradually increases in width from center to each end so that the space between ends of adjacent ties will be somewhat contracted and



RAILROAD TIE AND RAIL FASTENER.

thus operate to retain the ballast between the ties, the sides of the latter presenting uninterrupted faces throughout their length, which renders the tie more effective for this purpose.

Pertaining to Vehicles.

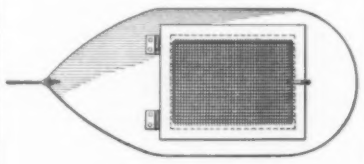
CARBURETER.—P. J. GROUVELLE, E. H. ARQUEMBOURG, and L. J. JORET, 71 Rue du Moulin Vert, Paris, France. The automatic carbureter presents this disadvantage, that for starting, the pure air flap valves are lifted and the fuel is not sucked in in sufficient quantity. The hand controlled one has this disadvantage: When the motor must exert all its power it is necessary to open entirely the suction inlet of the motor. The latter then slows down under the tractive force to be produced and does not suck a sufficient quantity of fuel. The present invention remedies these defects and consists in a device which combines hand and automatic control.

MACHINE FOR MAKING COOLER OR RADIATOR SECTIONS.—D. MCR. LIVINGSTON, New York, N. Y. Specifically the invention relates to an automobile machine for making the sections of coolers or condensers, particularly condensers in use in connection with automobile vehicles driven by water cooled internal construction engines. The cooler is formed of sections each having two sheets of metal shaped and matched together in a manner to produce a thin, flat, tortuous tube through which the water to be cooled is circulated.

COOLER.—D. MCR. LIVINGSTON, New York, N. Y. To give the cooler the greatest strength the bridging portion of each corrugation is vertically supported by the adjacent conduit, and the longitudinally-extending portions must be in alinement, so as to more effectively sustain the weight of the upper portions and add rigidity to the structure. All right-angle turns should be avoided and all portions of the conduit should be of substantially uniform width, whereby the flow of fluid is facilitated, and all restricted portions at bends or angles eliminated. This is accomplished in the present invention.

Pertaining to Recreation.

BAIT RECEPTACLE.—Capt. AUGUST C. SEEGER, East St. Louis, Ill. This invention shown in the illustration of the bait receptacle relates to receptacles for use in fishing and like purposes. The object here is to provide a receptacle for minnows and other kinds of bait which it is desired to keep alive by immersing the receptacle in water, which is so constructed that it can be easily towed while floating in the water, which tends to follow the course in which it is being towed, by means of which the bait can be kept alive for long periods, and which is so constructed that the bait can be easily and rapidly taken therefrom.



BAIT RECEPTACLE.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC.

AUTOMOBILE MECHANICIANS' CATECHISM. By Calvin F. Swingle, M.E. Chicago: Frederick J. Drake & Co., 1910. 16mo.; 110 pp. Price, $1.25.

As the name implies, all the information given is conveyed in the form of questions and answers. This is a very practical way of acquiring knowledge of a subject. Should the student desire to test his knowledge and his capacity for clearly expressing it, he may write his own answers and compare them with the answers given. On the other hand, the index allows of the use of the catechism as a "searchlight in trouble-finding." Should the tyro find himself stalled on some country road, unable to place the trouble, he turns to the index, finds "Breakdowns—what to do" and has expert advice immediately, in the fewest possible words. Inserts showing the plan and elevation of a chassis, with all parts numbered and named, add greatly to the completeness and utility of the handbook.

THE MINERALOGY OF ARIZONA. By F. N. Guild. Easton, Pa.; The Chemical Publishing Company, 1910. 12mo.; 103 pp.; illustrated.

Arizona is notably rich in mineral deposits, and its mountains and cañons have been attacked with such enthusiasm that the yield of specimens has been proportionately large and noteworthy. In their mode of occurrence, and in the beauty and variety of the crystallizations, the minerals found in this part of the country present unusual features. Vanadium, tungsten, and molybdenum are not uncommon, and the chemical and geological conditions which brought them into being well repay investigation. The recent discoveries of coronadite, morencite, and arizonite are chronicled, and the compositions of these deposits are given.

THE STANDARD FORMULARY. By A. Emil Hiss, Ph.G., and Albert E. Ebert, Ph.M., Ph.D. Chicago: G. P. Engelhard & Co., 1910. 8vo.; 1,256 pp.

The compilers have here combined in one volume six separate works. The first part consists of pharmaceutical preparations taken from such reliable sources as the United States, the German and the British Pharmacopeias. The other five parts comprise formulas for domestic and veterinary remedies, proprietary remedies, perfumes and toilet articles, domestic utilities and beverages. The units of quantity taken are those best adapted to popular use, such as the even pint or gallon. Troy weights and the metric system have been discarded. Accessibility is assured by alphabetical arrangement, and by an item index. The needs of the retail druggist have been kept carefully in view.

THE HISTORY OF THE TELEPHONE. By Herbert N. Casson. Chicago: A. C. McClurg & Co., 1910. 8vo.; 315 pp., illustrated. Price, $1.50 net.

This is no dry record of mere mechanical progress, but is written in a decidedly popular vein. The average man is well aware of the incredulity and scorn which Bell had to combat in bringing his instrument to a practical success; the glowing prospectuses of allegedly wonderful inventions have played their part of the story of the telephone, and used it to impress investors with the undeveloped possibilities of some new and generally worthless device; but Bell's difficulty in placing his invention on a marketable basis, and his ultimate thrilling success is but the mere framework on which hundreds of absorbing incidents are hung. Mr. Casson, who will be remembered as the author of "The Romance of Steel" and "The Romance of the Reaper," here gives us a new romance equally attractive and inspiring.

MOTION PICTURE HANDBOOK. By F. H. Richardson. New York: The Moving Picture World, 1910. 12mo.; 176 pp.; illustrated. Price, $1.50.

In this age of the motion pictures, such a handbook as this will not lack for readers. It tells everything which the would-be operator ought to know, and some things which the full-fledged operator should be familiar with, but, judging from results, is not. The source of the light, the wiring, resistance devices, lenses, carbons, the film, the various makes of projectors, all these are subjects of vital importance in the skillful manipulation of the motion picture machine. Managers may also turn these pages with benefit, not only because managers should know something of the art on which their business depends, but also because the final chapter appeals especially to them, its heads being the selection of a theater location; employees; advertising; film service; tickets; and vaudeville.

SUCCESS IN MARKET GARDENING. A New Vegetable Growers' Manual. By Herbert Rawson. New York: Doubleday, Page & Co., 1910. 12mo.; 271 pp.; illustrated. Price, $1.10 net.

This is a revision and amplification of a book of the same title by the late W. W. Rawson, father of the present author. It covers market-gardening methods in a general way, from the choice of a location and the preparation of the soil, to the gathering, handling and packing of the crops. There is a helpful section on the capital and labor required, and others dealing with implements, and with insects and preventives.

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MANUFACTURING BUSINESS—Outright or part; Presses and special machinery: established trade with best concerns in U. S. Reason, sickness. B. L. Wright, 212 East 56th Street, Chicago, Illinois.

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LOCAL REPRESENTATIVE WANTED.—Splendid income assured right man to act as our representative after learning our business thoroughly by mail. Former experience unnecessary. All we require is honesty, ability, ambition and willingness to learn a lucrative business. No soliciting or traveling. This is an exceptional opportunity for a man in your section to get into a big-paying business without capital and become independent for life. Write at once for full particulars. Address E. R. Marden, Pres. The National Co-operative Real Estate Company, L 378 ,Marden Building, Washington, D. C.

WANTED. A partner with sufficient money. Patent No. 988,379, whereby an engineer can open and close his own switch, from the moving train, by electricity.
W. F. Bath, Bisbee, Arizona.

WANTED—Parties to Manufacture Combined Whip Socket in Canada. Cash or Royalty. Locks with Pad Lock, two Parts on Hinges; also U. S. Royalty, Box 773, N. Y. City.

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Inquiry No. 9231.—Wanted, addresses of owners of water falls having a four-foot fall and upwards.

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Inquiry No. 9234.—Wanted a small specialty of universal salability to sell from $1 to $10. Proper articles can be financed.

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Inquiry No. 9236.—Wanted, the name and address of the firm making the New England Filling Machine.

Inquiry No. 9237.—Wanted, information relative to the Parmelee Automatic Aerated Water Still and Sterilizer.

Inquiry No. 9238.—Wanted, addresses of those who own deposits of rottenstone, lump pumice, infusorial earth or rubbing stone.

Inquiry No. 9239.—Wanted, addresses of parties who can ship ores containing any of the following elements Vanadium, molybdenum, uranium, tungsten, titanium.

Inquiry No. 9240.—Wanted, addresses of owners of limestone beds running not less than 98 per cent, and near a railway.

Inquiry No. 9241.—Wanted, addresses of owners of deposits of molders' sand suitable for heavy castings.

Inquiry No. 9242.—Wanted, addresses of makers of bag valves.

Parachutes for Aviators

(*Continued from page 800.*)

troversy. Its advocates are enthusiastic and have made many experiments. Some of these have ended tragically, as in the case of the German inventor Hayn. Others have been simply unfortunate without occasioning any injury except to the machine. Such instance is afforded by the recent test of the Reichelt apparatus at the Eiffel Tower, where the inventor, at the last moment, was happily inspired with the idea of replacing himself by a dummy. Still other experiments have been sufficiently successful to give great encouragement. Thus the experiments made by Tissier and Rollet at Vincennes have led these inventors to propose to construct an apparatus of practical size, large enough to carry a man instead of a guinea pig which was used in their experiments; and a man has been found courageous enough to offer to play the dangerous part of the passenger.

Those who are opposed to the use of the parachute assert that its application is impossible in practice. One of these irreconcilables, Mons. Surcouf, explains his position in an article in *Excelsior*, which may be condensed as follows:

"The parachute of the ordinary type cannot render any service to aviation or aeronautics of any kind. It even presents serious disadvantages, whether it is attached to the aeroplane or to the body of the aviator. In a fall from a moderate height the parachute may unquestionably be useful, but in falling from a great elevation only by a miracle could the aviator derive any protection from its use. If the parachute is attached to the aviator, how can he, confined to a limited space and either firmly attached to his seat or hampered in his movements by the parts of the aeroplane, free himself quickly enough to enable his parachute to act effectively? If on the other hand the parachute forms an integral part of the aeroplane, it must be opened either automatically or by the action of the aviator. Success in either operation requires a combination of circumstances which, it is no exaggeration to say, never occurs in practice. One might as well assert that the aviator would be able to regulate every detail of his fall. Moreover, by imparting a false sense of security, the parachute may lead the aviator to pay insufficient attention to his aeroplane and its guidance. The true parachute of the future will be the aeroplane itself which will certainly improve in strength and stability, and consequently in safety."

Nevertheless the anonymous writer from whose article in *La France Automobile et Aerienne* the present article is derived, expresses the opinion that, even with the most perfect aeroplane that can ever be devised, safety appliances will be no more superfluous than they are on ships, which, no matter how perfectly constructed, are provided with life boats, life preservers and various other devices for saving human life in case of shipwreck.

New York's Automobile Fire Service

(*Continued from page 806.*)

the light weight of the touring car engine and make a powerful and substantial machine. Thus the crankshaft weighs 185 pounds net and was forged from a single billet of vanadium steel with a tensile strength of 130,000 pounds.

The entire engine weighs sixteen thousand pounds and its pumps develop eighty-three horse-power. The contract specifications called for a pumping capacity of seven hundred gallons a minute, but in the test made at the bulkhead seven hundred and fifty gallons of Hudson River water were delivered and a pressure of one hundred and twenty-five pounds maintained.

It is about the propelling machinery,

(*Continued on page 817.*)

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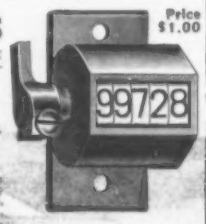

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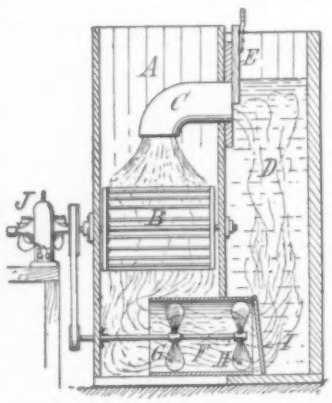
Notes and Queries

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12403) S. J. S. asks how to clean brushes. A. Dissolve a piece of soda in some hot water, allowing a piece the size of a walnut to 1 quart of water. Put the water into a basin, and after combing out the hair from the brushes, dip them, bristles downward, into the water and out again, keeping the backs and handles as free from the water as possible. Repeat this until the bristles look clean; then rinse the brushes in a little cold water; shake them well, and wipe the handles and backs with a towel, but not the bristles, and set the brushes to dry in the sun, or near the fire; but take care not to put them too close to it. Wiping the bristles of a brush makes them soft, as does also the use of soap.

(12404) W. L. W. writes: I have an idea for the generation of power without fuel, which I desire to submit for your consideration. If the idea herewith submitted is practical and workable, I expect to apply for a patent on the same, and the idea is therefore submitted to you in confidence. If, however, you believe it to be impossible or impractical, I should be very glad to see, in your valuable publication, a discussion of the proposition presented, and the reasons for its non-feasibility. In the accompanying drawing, *A* represents wheel pit, *B* represents water wheel or turbine, *C* represents intake and pipe leading to water wheel, *D* a lake or reservoir filled with water to a point above intake, *E* represents a water gate, *F* represents pipe in bottom of wheel pit, incasing a shaft to which is attached a water driver with vacuum fan on end of shaft, *G* represents water driver, *H* represents vacuum fan, *I* represents automatic valve, *J* represents an electric generator directly connected with water wheel, through which combination we expect to get power to run water driver and vacuum fan, and at the same time generate excess power. For the purpose of illustration, I may say the accompanying drawing has a water head of fifteen



feet through a pipe ten inches in diameter; and pipe in bottom of wheel pit, through which I expect to drive water back into lake or reservoir, is of the same diameter. I have experimented sufficiently to know that the water can be driven through pipe *F* by a water driver and vacuum fan similar to screw used in propelling a motor boat. The water gate and valve are designed to prevent flooding in case of a shut-down, and as a further preventive I suggest the use of a storage battery to drive the water out of wheel pit. There may be details to be worked out, but I think the thing desired to be accomplished is herein explained. The controlling question is, Can excess power be thus generated? If, in your opinion, the idea as submitted is not a good one, do you think any excess power could be joined by lifting water from wheel pit with a siphon? A. Your idea is only one of many variants of a scheme that has been presented to us from time to time. The form that the scheme has usually taken in previous instances is to return the water to the tank or reservoir, through a pipe; but whether it is attempted to be raised through a pipe after doing its work on the water wheels, or is forced into the reservoir at a point below the surface, makes no difference, because the energy required would be the same in each case. The scheme is wholly impracticable, and involves an attempt at perpetual motion. We think well to say also that the Patent Office does not grant patents on any apparatus intended to be self-operating or to produce perpetual motion, on the ground that no such apparatus can operate, and therefore cannot have utility, as required for a patentable invention. Any attempt to force the water into the reservoir will be resisted by a force corresponding with the hydrostatic pressure exerted by a column of water of a given height and given area of base, that is to say, a column whose base is at the point at which it is desired to return the water, and the drop of which column is represented by the surface of the body of water in the reservoir; to force the water inward, an energy is required sufficient to lift the afore-mentioned column of water. In accordance with the laws of hydrostatics, the size of the inlet, that is to say, the area of your automatic inlet valve and the height of the mentioned column of water, determine the total power necessary to return the water to the reservoir. The water wheels cannot generate more power in response to the falling water in the flume than the force represented by the hydrostatic pressure opposing the return of the water to the reservoir.

(12405) P. J. D. asks how to make massage cream. A. Preparations for massaging the skin usually depend upon a fatty base, and any bland ointment of the "cold cream" series will answer the purpose. These massage creams are also known as "skin foods," and the formulas for these are numerous. Lanolin is a popular addition, as it aids in holding a large percentage of water incorporated in the product. The addition of an alkali or alkaline salt, previously dissolved in the water, adds to the softening effect on the skin, which seems to be the object desired; almond or rose are popular perfumes, while the color is that of pink. The anhydrous lanolin is known as *oleum lanoe*, or *lanum*. When the ordinary lanolin is employed, the amount of water must be reduced in the formulas. Lanolin, anhydrous, 3 avoir. ounces; benzoated lard, 6 avoir. ounces; water, 9 fluid ounces; borax, 60 grains. Melt the lard and lanolin together; dissolve the borax in the water, warming the same slightly, and add to the melted fats, with stirring, until cool; perfume and color.

(12406) W. M. asks: Is there any metal that is a non-conductor of heat and cold? If more than one, which is the least expensive? If none, which is the nearest a non-conductor? A. There is no metal which is a non-conductor of heat. Among the poorest conductors are bismuth and mercury, which have about 1/55 the conducting power of silver.

(12407) N. P. T. asks for formulas for cements for barrels and casks. A. (1) Brewers' cement for coating.—The following compound is recommended as a good and cheap substitute for brewers' pitch: Coat twice the inside of a barrel with a solution of rosin, ½ pound; shellac, 2 ounces; turpentine, 2 pounds, and yellow wax, ½ ounce, in 1 quart of strong alcohol. After the complete drying of the second coat give a last coat by applying a solution of 1 pound shellac in 1 quart of strong alcohol. This varnish will perfectly cover up the pores and does not crack off or impart a foreign taste to the beer. (2) Cement for closing.—Tallow, 5 parts; wax, 4 parts; lard, 8 parts, wood ashes, sifted, 5 parts. Apply with heat. (3) Leaking barrels.—Melt at a low heat a mixture of lard, 30 parts; rock salt, 30 parts; wax, 10 parts, and paraffine, 6 parts. To this add 25 parts finely sifted wood ashes. This cement is applied warm over the leaky places. (4) Massiat's cement for covering bungs.—Melt rubber with 10 to 20 per cent tallow or beeswax. Gradually add finely powdered quicklime. (5) Wax putty for bungs, etc.—Yellow wax, 4 pounds; tallow, 2 pounds; spirits of turpentine, 1 pound; solid turpentine, 6 pounds. Melt the wax and solid turpentine over a gentle fire; add the tallow. When melted take entirely away from the fire, add the spirits of turpentine, let it cool.—From the new "SCIENTIFIC AMERICAN Cyclopedia of Formulas." Price, $5.

(12408) B. R. T. says: Can you tell me the quantities of ottos, otherwise essential oils, yielded by various plants: A. They are as follows:

	Pounds.		Otto, Ounces.
Orange peel	10	yield about	1
Dry marjoram herb	20	"	3
Fresh marjoram herb	100	"	3
Fresh peppermint	100	" 3 to	4
Dry peppermint	25	" 3 to	4
Dry origanum	25	" 2 to	3
Dry thyme	20	" 1 to	1½
Dry calamus	25	" 3 to	4
Anise seed	25	" 9 to	12
Caraway	25	"	16
Cloves	1	"	2½
Cinnamon	25	"	3
Cassia	25	"	3
Cedar wood	28	"	4
Mace	2	"	3
Nutmegs	2	" 3 to	4
Fresh balm herb	60	" 1 to	1½
Cake of bitter almond	14	"	1
Sweet flag root	112	"	16
Geranium leaves	112	"	2
Lavender flowers	112	" 30 to	32
Myrtle leaves	112	"	5
Patchouly herb	112	"	28
Provence rose blossom	112	" 1½ to	2
Rhodium wood	112	" 3 to	4
Santal wood	112	"	30
Vitivert or kuskus root	112	"	15
Violets	112	"	½ dr

Important and Instructive Articles on Aviation

IN the *Scientific American Supplement* we have published in the past few years papers by some of the more eminent physicists and engineers on flying machines. No book thus far published is so complete and so authoritative as these articles. The range of the articles is wide, covering as it does the theoretical side of aviation as well as those more practical aspects which deal with the construction of machines. The following is a partial list of the more important articles which have appeared in the *Scientific American Supplement;* see special note below.

¶ 1816, 1817, 1818, 1819, 1820, 1821 and 1822. **The Practice and Theory of Aviation.** By Grover Cleveland Loening, A. M. This is the most compact paper on aeroplanes that has probably ever been published. Fourteen biplanes and monoplanes are described in detail, and illustrated with scale drawings, namely, the Farman, Cody, Curtiss, Wright, Voisin (old model), Voisin (new model), and Sommer biplanes, and the Antoinette, Santos-Dumont, Bleriot XI, Bleriot XII, Grade, Pelterie and Pfitzner monoplanes. The proper dimensioning of aeroplane surfaces, as deduced by famous experimenters from their tests, is also considered. Taken as a whole this series of seven papers constitutes an admirable text book.

¶ 1713. **The Wright Aeroplane.** This is a thorough description of the old type of Wright biplane with the horizontal elevation rudder in the front of the machine. Excellent diagrams and photographic views accompany the paper.

¶ 1756. **Louis Blériot and His Aeroplanes.** Few people realize that Bleriot's successful monoplane is the result of ten years of daring and perilous experiment. In this paper will be found an instructive description of the evolution of the present successful Bleriot monoplane, illustrated with diagrams and photographs.

¶ 1768. **The Farman Biplane.** A complete description of the Farman biplane, with detail drawings of the box tail and vertical rudders, the manner of working the four ailerons, hand and foot levers which control the machine, plan view and side elevation of the entire machine.

¶ 1767. **The Santos-Dumont Monoplane.** An illustrated article describing the Demoiselle, the smallest and one of the fastest machines thus far made. Sketches accompany the article, showing the details of the construction and control.

¶ 1582. **How to Make a Gliding Machine.** Full details and drawings which will enable anyone to make a glider for $15.00.

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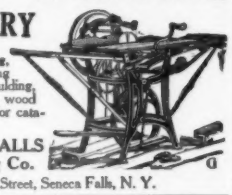

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of course, that the greatest interest centers. The one hundred horse-power of the gasoline engine might be compared with a possible thirty horse-power of three horses. A horse-power of one hundred is sufficient to maintain a speed up to forty miles an hour and to carry the engine up such hills as those in St. Paul and on upper Lexington Avenue in New York city. The machine can be readily controlled, and the New York Fire Department is now training firemen specially for this purpose. With chains on the rubber-tired wheels the engine can travel effectively over snow and ice. It has a seat for an extra fireman besides the driver; and while having a longer wheel base than the ordinary engine, yet it is considerably shorter when the horses are considered. In the presence of fire officials and engineers this new machine was thoroughly tested on March 16th, every possible condition of pavement and grade to be encountered being tried as well as the pumping capacity. Afterward the engine was put into service at an uptown station where the company is located in a dangerous district and answers some one thousand alarms a year. These particular alarms require a prompt response, and the new engine will have every opportunity to prove its advantage. The economy is of course obvious, although the transformation of such a fire engine and the addition of the motors costs about $4,500, making the total expense for the engine $10,000 or $11,000. The only expense of maintenance is for fuel and lubricating oil. Inasmuch as the mileage even on a thousand alarm a year basis is very small, the deterioration is not to be compared with that of a commercial truck or even a touring car, both of which are run for long distances with a considerable aggregate in the course of the year. The annual saving is estimated at about $2,000 per annum; and in addition to the elimination of the horses, space is released for another unit, such as a second engine or extra hose tender, not to mention the fact that the quarters are made pleasanter for the firemen.

With the motor fire engine are to be considered also the new motor hose tenders, of which three of huge size and one single wagon have been delivered. These mount a turret nozzle and carry the heavy hose for the high pressure companies where the engine is now displaced. Then there is the automobile water tower described at length in a recent issue of the SCIENTIFIC AMERICAN. This was shown at the recent test and illustrated how readily such a massive piece of apparatus could be handled, it being possible to turn the long carriage on the rear wheels as a pivot. Though the horse may be missed as a picturesque sight in our metropolitan streets, yet the gain in time and power may prevent some threatened conflagration.

Pure Science and the Public Weal

(*Continued from page 309.*)

This condition gives a powerful fresh reason for defending pure abstruse science. Applied science always has been, is now, and probably always will be distinctly subsidiary to pure science. The final justification of all scientific research is undoubtedly the power it creates for the use of mankind, *but the power must be created before it can be used.* A little study of the history of science should suffice to convince any reasonable mind that the command we possess to-day over nature is due to the labors of men who have almost invariably pursued knowledge with a pure devotion uncontaminated by any worship of usefulness. These devoted idealists have gathered the varied mighty harvests by which all men have profited, but the debt of gratitude to them is unpaid.

"The pursuit of abstruse science needs to be encouraged. It is insufficiently esteemed. This doctrine ought to be emphasized on all suitable occasions, but especially before the section of experimental medicine. The people cry for relief from sickness and their demand for prompt useful discoveries is so urgent that there is danger in it, since it tempts medical investigators away from the fundamental inquiries, which, answered, will give great results, and seduces them to work exclusively at secondary problems, from the solution of which quicker but smaller results may be expected. Pure science is broad; it embraces all. Applied science is a congeries of fragments, of isolated problems, which lack cohesion and are without any necessary connection with one another. It is easy to understand why students of applied science have seldom made great discoveries.

"In fact, scientific knowledge will not be compelled. We have to take what knowledge we can get, and by no means can we get always what knowledge we want. Pure science adapts its undertakings to these rigid conditions, and works where the opportunity is best—not so applied science.

"Let us recall a few of the epoch-making discoveries. When Galileo turned his lean face up toward the swinging lamp in the Cathedral of Pisa and as he looked discovered the law of the moving pendulum, he was in quest of pure knowledge. We can not conceive such a man actuated by any lower motive. Even when we learn of his astonishing the Venetian merchants by enabling them to see their far-off vessels through his newly invented telescope, do we not feel that it was merely an episode to Galileo? Such a man does not ask 'What use is it?' His demand for knowledge was insatiable. We have only to read the words of the great pioneers to convince ourselves that they were all in search of knowledge for knowledge's sake. Yet they are the giants of human history, who in importance are approached by few monarchs or statesmen. Compared with the growth of science the shiftings of governments are minor events."

Novel Log Skidding and Loading Machine

(*Continued from page 311.*)

propelling. It is of interest to note that the skidding engine is equipped with link motion for reversing so that the machine may be moved in either direction along the track.

One of the most remarkable of the various types of steam log loading machines in service to-day is shown in the illustration at the right hand side. Its construction is unique for loading operations as it provides for passing the empty cars and trucks through the machine on the very track on which the machine travels. When the machine is in a position for passing the cars through to be loaded, the trucks are swung out and upward by the hoisting engine, thus allowing the machine to settle down on four curved legs. This arrangement leaves a clear track under the machine through which the cars can be drawn for the purpose of loading.

The curved legs are provided with flexibly connected shoes long enough to cover from three to five ties each, which gives the machine an exceptionally wide and substantial foundation or base. This self-propelling steam log loading machine is usually provided with a steel swinging boom but in some instances wood booms are employed.

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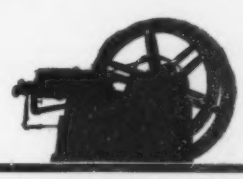

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Aeronautics

A Proposed Aeroplane Race from Rome to London.—In addition to the cross-country aeroplane race already proposed from Paris to Berlin and London, some Italian sportsmen are about to organize a similar race from Rome to London and back, via Brussels and Paris. Besides these two big races, there are several local circuits proposed in France, Germany and England, so that these countries should all witness plenty of cross-country flying during the coming summer.

Delivering a Message by Aeroplane under War Conditions.—On the 16th inst. Aviator Parmalee and Lieut. Foulois flew from the division encampment at San Antonio, Texas, 26 miles to Leon Springs. After delivering a message to a theoretical division, the return trip was made over a slightly longer route. The total time of the trip was 1¾ hours. An elevation of 1,000 to 1,800 feet was maintained throughout the trip, which, according to Major George O. Squier, was one of the most successful that has thus far been made by our army aviators.

Flying in Mexico.—During the exhibition flights of the international aviators at Mexico City recently, M. Garros several times circled Chapultepec Castle in a spectacular flight from the aviation field. On March 2nd he won the Mexican Herald Cup by ascending to a height of 4,550 feet during a splendid flight of 48 minutes' duration. M. Barrier attained a height of 3,200 feet in a 22-minute flight. Alberto Braniff, a wealthy novice, collided with a tree while making one of his first flights. His machine was badly damaged but he himself was uninjured.

An Anniversary.—On March 5th occurred the first anniversary of the first flight of over an hour with three persons on an aeroplane. This achievement was credited to Henri Farman twelve months ago. By way of illustrating the progress since then, one may recall the recent accomplishment of the Blériot "aerobus," which sustained eight passengers during a flight lasting just under 10 minutes. How extraordinary the feat was cannot be realized until one learns that one of the men was forced to find a seat on the tail of the machine, there being no room for him on the main body.

Record Cross-country Flight by Four Military Aeroplanes in France.—After remaining at Pau for a month since his arrival there from Paris in his Blériot, Capt. Bellenger expected to leave there and fly back to Paris on the 4th inst. He was preceded on March 3rd by four other new military aviators on their Blériot monoplanes. Two of these, Lieut. De Malherbe and Ensign Conneau, made a successful flight to Libourne, twenty miles northeast of Bordeaux. They covered a distance of 110 miles. Lieut. Princetau became lost in the fog forty miles north of Pau, and landed at Mont de Marsan, while Lieut. De Rose had a breakdown soon after he started, and was obliged to land and repair his machine. Capt. Bellenger expected to overtake the other aviators and to lead the way for the balance of the journey.

Record Flight of a U. S. Army Wright Biplane.—The longest two-man flight across country in America occurred on March 3rd when the army biplane was in the air for 2 hours and 7 minutes, traveling from Fort McIntosh, at Laredo, Texas, to Eagle Pass. The aeroplane was carefully provisioned before the start, its gasoline tank being filled with twenty-five gallons of fuel. A compass and other instruments were also fitted. Two days' rations were taken for each man, as well as a supply of chocolate for emergency. Each man carried an army revolver and forty rounds of ammunition. Lieut. Foulois, besides a pair of field glasses, had a map of the country and a pad and pencil with which to take notes. Observations were made in detail throughout the flight and the practicability of the aeroplane for scouting was thoroughly demonstrated. The flight began at a few minutes before 2 P. M. and was aided by a favorable breeze from the southwest. The aeroplane rose rapidly, circled at a height of 200 feet, and started off in a northeasterly direction, following the Rio Grande. It rose gradually to a height of about 4,000 feet, and was lost to view in 12 minutes. The only report received of the aeroplane during its flight was from a coal mine 25 miles away, where observers noted it at a height of some 2,000 feet, flying smoothly. This first long-distance flight of an army aeroplane was accomplished at the excellent speed of 54.85 miles an hour, which is a record speed for an aeroplane carrying two men and covering such a long distance—116 miles—across country. The return flight was attempted a few days later, but the motor broke down after the aeroplane had covered about 12 miles and the machine landed in the river and was damaged.

Electricity

Finding Pearls with Roentgen Rays.—According to a report from our consul in Birmingham, England, a suggestion was recently made that Roentgen rays be used to ascertain whether an oyster contains pearls. In this way, it will be unnecessary to open the oyster's shell and destroy the oyster, unless it contains pearls. If the Roentgen rays show that there are no pearls present, the oyster will be put back into the water where it may continue to grow.

"Sheep-nose" Cars.—An interesting type of car is in use on the electric railway running from Indianapolis to Toledo. This car is provided with a parabolic front end, commonly called a "sheep-nose." The object of this arrangement is to reduce wind resistance when the cars are running at high speed, also to make it easier for the car to force its way through snow drifts. The frame of the car is very strongly built, and is arranged to carry a steel sheathed pilot which serves as a snow plow.

Direct Current Railroad in Italy.—Owing to the large amount of water power in Italy, available for generating electricity, considerable progress has been made by that country in the matter of electrifying railroads. Heretofore alternating current has been used rather than direct current. Now, however, a railroad has been constructed which is to be operated by direct current. A 1,200-volt system will be used, and the cars can also be run on 600-volt systems in towns. The machinery for this system is supplied by an American firm. It is considered rather significant that the alternating current system, which is typically Italian, should be yielding to the direct-current system of this country.

Breakdowns Caused by Chemical Action.—An interesting paper was read lately by A. P. Fleming and R. Johnson before the Manchester section of the Institute of Electrical Engineers, on chemical action in high tension windings. They found that no chemical action took place unless the voltage was higher than 3,500, and then it occurred only where there were air pockets present. The action was initiated by a discharge across the air pocket, producing ozone and nitrous or nitric acid. This gas acted upon the insulating material, producing disintegration. Oils and gums of varnishes were oxidized, but asphaltum was not seriously attacked. Mica was not injured at all, but the gas attacked the cements used with mica. They showed that if the air in pockets was not replenished, chemical action ceased. The conclusion was reached that mica is the best material to be used between turns of the winding.

The Power Station During a Squall.—It is probable that few people realize the effect of a sudden squall in the day time upon the central station. It means, of course, that the power station must be prepared to furnish a large supply of extra current to meet the demands for light throughout the city. On the second of this month, there was an occasion of this sort, when the sky was darkened so suddenly, and the darkness was so complete, that the power stations were fixed to the utmost to keep pace with the sudden demand for current. Just before the storm, the system operator detected the clouds on the horizon and telephoned to the stations to be prepared for a sudden peak load. Five minutes later the reserve units were put in service, furnishing altogether 74,500 kilowatts. In another five minutes, all available resources were used and the load had risen to 124,500 kilowatts, or nearly 167,000 electrical horse-power. The load during the storm was 20,000 kilowatts more than that of the evening load.

The International Congress at Turin.—Plans are being made by the Organizing Committee of the International Congress of the Applications of Electricity to be held at Turin, Italy, from September 9th to 20th, 1911, to make this meeting a decided success. An official list of subjects has been given out, on which original papers are to be read. Lecturers will be appointed to prepare these papers. The subjects cover all phases of electricity. There will be a number on electrical generators, the operation of power plants, and various apparatus associated with a power station. Other subjects will be incandescent lamps, electric traction, reduction of steel electrically, sterilization of water, wire and wireless telephony and telegraphy, electric heating, variable speed motors in paper mills and rolling mills, electricity in submarine boats, distribution of electric power for agricultural purposes, government control of meters, and methods of taxing electricity in different countries. Altogether, 31 lectures have been provided for on these and other subjects.

Practical Books

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Drop Forging, Die Sinking and Machine Forming of Steel

By JOSEPH V. WOODWORTH. Octavo, 341 pages, 304 illustrations. Price, $2.50.

¶ A complete practical treatise on the hot and cold machine forming of steel and iron into finished shapes, together with the tools, dies and machinery involved in the manufacture of duplicate forgings and interchangeable hot and cold pressed parts from bar and sheet metal. It is a comprehensive and modern work, written by an expert, and treating fully on modern shop practice, processes, methods, machines, tools and details.

Dies: Their Construction and Use for the Modern Working of Sheet Metals

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Punches, Dies and Tools for Manufacturing in Presses

By JOSEPH V. WOODWORTH. Octavo, 483 pages, 702 illustrations. Price, $4.00.

¶ This work is a companion to the author's elementary work entitled "Dies, Their Construction and Use." It does not go into the details of die making to the extent of the author's previous book, but gives a comprehensive review of the field of operations carried on by presses. This book might well be termed an encyclopedia of die making, punch making, die sinking, sheet metal working, and making of special tools, sub-presses, devices and mechanical combinations for piercing, punching, cutting, bending, forming, drawing, compressing and assembling sheet metal parts and also articles of other materials in machine tools.

American Tool Making and Interchangeable Manufacturing

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Engineering

Strength of Japanese Navy.—The present strength of the Japanese navy is as follows: Fourteen battleships, of 223,234 tons; one time-expired battleship of 10,960 tons; thirteen first-class cruisers, 138,052 tons; seven second-class cruisers 38,052 tons; thirteen third-class cruisers, 43,713 tons; fifty-seven destroyers; fifty-nine torpedo boats, and thirteen submarines.

The Morris Canal to Be Abandoned.—The Morris Canal, built between 1828 and 1836, at a cost of five million dollars, which extends from the Delaware River at Phillipsburg to the Hudson River at Jersey City, a distance of 102 miles, is to be abandoned by the Lehigh Valley Railway Company, if the consent of the State of New Jersey can be secured. The heaviest traffic, in the year 1866, was 890,000 tons. An interesting feature is the system of 22 inclined planes, over which the boats, built in two sections, are hauled from one level to another.

Hudson Tunnel for Catskill Aqueduct.—To secure sound rock for the entire length of the Catskill aqueduct tunnel it has been necessary to go down over one thousand feet below the river surface. Investigation was made by wash borings, by diamond drills operated from scows on the river, and by inclined diamond borings started from the bottom of shafts sunk 300 feet on each side of the river. One of these inclined holes was over 3,000 feet long. The inclination was determined by sinking in the shaft glass tubes filled with hydrofluoric acid, which etched a true horizontal line on the interior surface.

The Important Government Jetty at San Pedro.—After ten years of constant labor, the government completed a few months ago the huge breakwater at the harbor of San Pedro, Cal., which extends seaward for a total distance of 9,250 feet, with a width at the top of 250 feet, and a mean width of 200 feet at the bottom. At the extreme outer end the depth of water is 48 feet, and here will be erected a permanent light and fog station, which will rest on a solid concrete foundation 40 feet square. Nearly 2,500,000 tons of rock were used in the substructure, and 232,600 tons in the superstructure. The total cost of the rock alone was $2,748,690.

Safe Railroad Travel.—Not a single passenger out of 136,000,000 carried on the Pennsylvania Railroad in 1910 was killed in a train accident. This is brought out in a report issued by the company giving accident statistics for the years 1908, 1909 and 1910, for the Pennsylvania lines east of Pittsburg and Erie. Combining the statistics for these years, it is shown that during that period the number of passengers carried on the lines east of Pittsburg and Erie was 371,858,277—more than four times as many people as there are in the United States—and that only one of them was killed as a result of a train wreck.

Aiming Guns from the Conning Tower.—According to cable dispatches from Gibraltar, the new battleship "Neptune" has recently made a test of a new system of aiming the main battery, which has been originated by Percy Scott, the father of the modern system of target firing. It is stated that, while the "Neptune" was steaming at 13 knots, she fired two broadsides in quick succession at a target moving at the same speed at a distance of 8,000 yards, and that every shot went home. The aiming and firing of the guns is done entirely from the conning tower, the duties of the gun crews being merely to load the guns. If this be true, Scott has made an advance second only in importance to his famous improvements of five or six years ago.

A "Longest Ship" Competition.—To the outside public there is something humorous in the competition among steamship companies for the distinction of possessing the longest ship in the world. The race just now is between the Hamburg-American and Cunard companies. The "Europa," of the former line, has been increasing in her reputed dimensions during the past two or three years, until press dispatches speak of her as a 900-foot ship, to which length she has grown from her official stated length of 885 feet, which would give her 2½ feet advantage over the "Olympic" and "Titanic." The new Cunarder "Aquitania," which also was announced as an 885-foot ship, appeared in the plans for dock lengthening, which were presented during the recent pier-lengthening controversy at New York, as having a length of 900 feet. Both vessels are under construction, and it will be necessary shortly to set up their stem and stern pieces, definitely settling the length. At present, in each case, this is officially announced as 885 feet.

Science

The "Albatross" on a New Cruise.—The Government steamer "Albatross" left San Diego on February 28th on a scientific mission. She will steam as far south as Central America, and engage in sea dredging for specimens of the deep water life existing along the lower coast.

The Price of Platinum.—Platinum is now quoted at $42.00 an ounce for the hard metal and $41.00 an ounce for the soft metal, the highest prices ever reached. In 1905 pure platinum was sold for $8.50, with only a languid demand. Early in 1906 the sales began to increase, and prices steadily advanced until, in December of that year, platinum was selling at $38.00 an ounce, and hard platinum touched $40.00. The production of platinum in this country is small. The chief source of supply is the Ural Mountains in Russia.

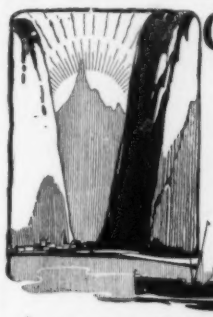
The Nature of the Aurora.—According to a theory recently enunciated by Prof. Lenard, the aurora borealis is formed of cathode rays, emitted by the sun and deflected by the terrestrial magnetic field in the upper strata of the atmosphere. The velocity of these cathode rays must be nearly equal to that of light, and very much greater than the velocity of cathode rays produced in the laboratory. Lenard concludes that these extremely "hard" cathode rays are emitted by unknown radio-active substances in the sun.

A Society for the Advancement of Science.—The society which was founded lately by the Emperor William for the advancement of science is taking active measures at present in order to raise an endowment for scientific research. At the last meeting about a hundred members were present, the chairman being the Minister of Public Instruction, and various plans were laid in order to carry out the work. The society intends to begin by founding two chemical institutes under Profs. Beckmann of Leipzig, and Haber of Karlsruhe. Then a biological institute will be founded.

Roosevelt and the Smithsonian Institution.—Of the hundreds of animals killed by Roosevelt and sent to this country, comparatively few will be mounted by the Smithsonian Institution—in fact, only fifty. Naturally the Colonel was not in the best of moods when he learned that of the 3,000 skins of animals, but a few will be generally useful. The Smithsonian Institution states that not more than fifty different kinds of animals could be detected among the many killed, by an untrained observer, and that the general public would only be fatigued and confused by an inspection of the entire series. Besides, there does not seem to be enough money on hand to handle all the collection adequately.

Coins of th Gallo-Roman Period Discovered in France.—Coins buried for 1600 years came to light at Dompierre, France, when a farmer was leveling his yard. These date from the Gallo-Roman period and number about 2,800. Of these, some 2,000 are silver and the rest bronze. They had been buried in an earthenware vessel placed in a stone-built hiding place. As to the silver coins, these are in a very good state of preservation and are fine specimens, but the bronze coins suffered much from the air. A number of rare pieces were found in the collection coming from the reigns of some obscure Roman emperors of the late period. The oldest coins date from the Emperor Trajan (63 to 117 A. D.) and the most recent, from Diocletian. It is thought that the coins were buried about 315 A. D.

Elephant Seals at the New York Aquarium.—The expedition recently sent out by the American Museum of Natural History and the New York Zoological Society to lower California, under the leadership of Dr. Charles H. Townsend, has been successful in capturing six young California sea elephants (*Macrorhinus angustirostris*, Gill) on Guadalupe Island. These specimens, the first ever captured alive, were sent from San Diego, California, on March 7th, and arrived at the New York Aquarium on March 13th, in excellent condition after their six-day trip. For transportation they were crated separately and shipped by express without food or water *en route*. Although not more than nine months old, the average weight of these animals is about 250 pounds, and the length four and one-half to five feet. The adult males reach a length of more than twenty feet. The species which is distributed among the small islands of the southern and lower California coast is now verging toward extinction, and very little is known of its life history or habits. The common name of the species is derived from the fact that the male possesses a protrusile snout or proboscis. In the young males now at the aquarium this is only slightly developed.



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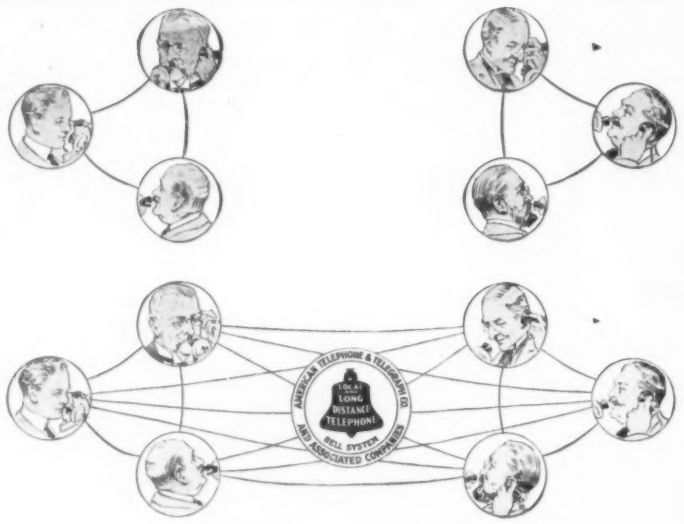

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